Low Back DVD Manual

Welcome to the program on low back pain. This manual will help you work through the DVD program and serve as a memory tool for the lesson. As you watch the DVDs, follow along the sections in this manual - take notes, highlight important information, mark the sections you want to return to. Use it in any way that will help you.

DVD #1 - Low Back Anatomy in Depth

PreTest

1. If resisted dorsiflexion of the ankle and resisted extension of the great toe is weak, what is the most likely injury?

Answer: _____

2. What are the most commonly injured structures in the low back?

Answer: _____

3. Pain down the back of the thigh and calf and into the heel is most commonly caused by injury to what structure?

Answer: _____

4. The most pressure is exerted on the low back discs during:
   a. Sitting
   b. Standing
   c. Bending
   d. Walking

Answer: _____

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5. If there is low back pain associated with difficulty in excretory functions, this is a sign of:
   a. A condition that should be referred to a urologist
   b. An S4 nerve root compression
   c. A pubic ligament sprain
   d. An L5 central disc protrusion

Answer: _____

6. Which spinal ligament connects consecutive spinous processes but is not continuous from one spinous process to another?
   a. Supraspinous ligament
   b. Interspinous ligament
   c. Ligamentum flavum
   d. Sacrotuberous ligament

Answer: _____

7. Pain that is referred from the low back region directly to the lateral calf is likely to be caused by an injury to what structure?

Answer: _____

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Anatomy of Relevant Structures

Spinal Structure

- Vertebrae
- Spinous & Transverse Processes
- Zygapophysial Joints
- Intervertebral Discs

Vertebrae

The vertebrae are the major building blocks of the spine. They are stacked one on top of another with the intervertebral discs between them. The vertebrae work together with the intervertebral discs, ligaments, and muscles to support and move the spine. The spine supports about half of the body's weight. The other half is supported by the muscles. The spinal cord ends at L1 or, sometimes, L2; individual nerves continue down the spinal canal until they exit the spine at the appropriate level. There are three major areas of the lower spine: the lumbar region, the sacral region, and the coccyx.

The vertebrae in the lumbar region have two major functions. First, they carry the lion's share of the weight of the body. Second, they protect the spinal cord and the nerves within the spinal canal.

The lumbar region consists of five vertebrae that increase in size from level to level. Like the vertebrae in the rest of the spine, each of the five lumbar vertebrae has three joints, one disc, and a pair of Zygapophysial joints (which are often referred to as facet joints). Most of the rotation, flexion, and extension in the low back occurs in the five lumbar vertebrae — not in the thorax or the sacrum.

The sacrum is shaped like a triangle and is formed by four to five fused vertebrae. It is wedged between the iliac bones, forming a keystone connecting the trunk of the body to the pelvis.

The coccyx, often referred to as the tailbone, is the last segment of the spine. It consists of three to five rudimentary vertebrae which are usually fused into three or fewer segments, just below the sacrum. A small segment of the population has a fused coccyx, but most have two or three moving segments. The coccyx is attached to the sacrum via a fibrocartilaginous joint which permits limited movement between them. It is held together by a series of ligaments which can be very painful when injured. The borders of the coccyx provide attachment sites for the sacrotuberous and sacrospinous ligaments. The coccyx also provides an attachment site for muscles such as the gluteus maximus.

Spinous Processes

Spinous processes are projections of bone at the back of the vertebrae to which the muscles and ligaments are attached. The spinous processes in the low back are particularly broad and thick.

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Some individuals have spinous processes that are relatively short and lie deep within the low back, so they may be harder to find until you get more skilled with practice. In other people, the low back is relatively flat or curves backward in a posterior direction; this makes it easier to find these structures.

Another variable is the amount of space between the spinous processes. In some individuals this space is very wide and clearly defined, but in others the processes are so close together that you can barely feel any space between them.

Transverse Processes

The transverse processes, sometimes abbreviated as TPs, are bony protrusions on either side of each vertebra. They provide attachment sites for many muscles and ligaments. In the low back, they are large but buried under layers of muscles and fascia.

Zygapophysial Joints

The zygapophysial joints are often referred to as "facet joints." Although this common name is easier to pronounce, it is anatomically incorrect. The word "facet" refers to the articular cartilage surface in many small joints throughout the body, such as the phalanges and costovertebral joints. Zygapophysial joints are true synovial joints. In addition to articular cartilage, they contain a joint capsule and a synovial membrane.

Each vertebra has two sets of zygapophysial joints - one for articulating with the vertebra above, and one with the vertebra below. In association with the spinal discs, these joints allow for movement between the individual vertebrae of the spine. The primary movements permitted by the zygapophysial joints are flexion and extension of the spine. Their joint capsules serve to limit side-flexion and rotation. Their capsular ligaments protect the posterior portions of the discs from excess flexion and torsion forces.

Intervertebral Discs

The intervertebral discs make up one-fourth of the length of the spinal column. The low back discs support more of the body's weight and are therefore considerably larger than the discs in the thorax or cervical areas. Each disc is named for the vertebra above it - the disc between L4 and L5 is called the L4 disc, and the one between L5 and S1 is called the L5 disc. There are no discs between S1 and S4, or between the vertebrae that form the coccyx.

Above and below each disc is a thin layer of cartilage, known as the vertebral end plate, which attaches the disc to the adjacent vertebrae. Because discs have no direct blood supply, their only sources of nourishment are the nutrients that diffuse across these end plates.

The intervertebral discs are the spine's shock-absorbing system. They also provide cushioning to protect the vertebrae, the brain, and the nerves. Without the discs there would be very little motion in the spine. The majority of spinal motion takes place in the cervical and lumbar regions. The thoracic joints have very little motion because they are fixed in place by the ribs.

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The intervertebral discs are composed of two parts: the annulus fibrosis (the outer ring) and the nucleus pulposus (the softer gel-like center). The discs are made up of water, collagen, and proteoglycan or PG molecules. The annulus fibrosis consists mainly of collagen fibers. These fibers are arranged in concentric sheets forming a strong outer ring that connects to the vertebral end plates and encloses the nucleus pulposus.

The nucleus pulposus consists mainly of PG molecules, which form a water-rich gel that resists compression. PG molecules are important because they attract and retain water, and a high water content is critical to proper disc functioning. The amount of water in the nucleus pulposus gradually decreases throughout the day. This is because whenever we stand or sit, a gravitational compression force is exerted on the vertebrae. As a result of this compression, water diffuses from the discs through the end plates into the vertebral bodies, making us a little shorter at the end of each day. While we sleep, the water diffuses back into the discs, and we awake at our normal height. Over time, discs naturally wear out and degenerate. They become thinner and more rigid. The liquid content of the discs gradually diminishes, which reduces their ability to absorb shock.

Nerves

- Spinal Cord
- Spinal Nerves
- Sciatic Nerve
- Nerve Roots
- Nerve Trunks

Spinal Cord

The spinal cord is composed of a bundle of nerves running down the central canal of the spine, from the brain to the lumbar and sacral regions. It is surrounded by a tough, fibrous membrane called the dura mater. At each vertebra, small bundles of nerves branch off, transmitting nerve impulses to and from various parts of the body. The spinal cord actually ends at L1, or in some cases, L2. After L2, the nerves travel down the spine without the protection of the spinal cord. This area is referred to as the cauda equina, because it resembles a horse's tail.

Spinal cord injuries occur when a traumatic event causes damage to individual cells within the spinal cord or a complete rupture of nerves within the cord. Spinal cord injuries occur most commonly in the cervical area.

Spinal Nerves

Nerves are the body's communication system. Without nerve signals, we would cease to function. The spinal nerves carry messages from the brain through the spinal cord to the rest of the body. There are nine pairs of spinal nerves in the low back and sacral region.

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The L1 nerve exits the spine between the L1 and L2 vertebrae, the L2 nerve exits between L2 and L3, and so forth. As they exit the spine, the spinal nerves travel through small openings between the vertebrae, which are called the intervertebral foramen. Then they branch off into motor nerves and sensory nerves. The nerves of the lumbar spine go to the pelvis, abdomen, thighs, lower legs, feet and toes. Whenever the body gets hurt in some way, the nerves signal the brain with information about the injury. Damage to the nerves themselves can cause pain, tingling, numbness, or weakness.

Nerve Roots

The nerve root is the first half-inch or so of a nerve as it exits the spinal canal. It is enclosed in a tapering sleeve of dura mater, an extension of the fibrous membrane that encases the spinal cord. Pain caused by a protruding disc often involves this portion of the nerve. This condition is referred to as a nerve root compression or a radiculopathy (which means a pathology of a nerve).

Nerve Trunks

The nerve trunk is the portion of a nerve that extends beyond the dural sleeve. Pressure on a nerve trunk generally causes no pain, only distal tingling and paresthesia. The paresthesia occurs in the area of the body that receives signals from that nerve. The location of the paresthesia will tell you which nerve is affected, but will not tell you where on the nerve the pressure is occurring. Pressure exerted at any point along the nerve trunk will cause roughly the same symptoms.

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Sciatic Nerve

The sciatic nerve is the largest, longest nerve in the body. It's about a half-inch thick and runs from the lower spine through the buttock to the back thigh, and down to the foot. It is not a single nerve, but rather consists of the joining of five nerves exiting at L4, L5, S1, S2, and S3. At the back of the knee, the sciatic nerve divides to become two nerves, the tibial and peroneal nerves, which continue down the lower leg to the feet and toes.

Sciatica is a loosely-used term that simply means a pain going down the leg. This type of pain may result from compression of one of the nerves within the sciatic nerve. However, it may also be caused by a muscle injury in the buttock, a ligament injury in the low back, or spinal stenosis, which is a narrowing of the intervertebral foramen.

Ligaments

- Supraspinous Ligaments
- Suprasacral Ligaments
- Interspinous Ligaments
- Intertransverse Ligaments
- Iliolumbar Ligaments
- Sacroiliac Ligaments
- Sacrotuberous Ligaments
- Sacrospinous Ligaments
- Coccygeal Ligaments

Supraspinous Ligaments

The supraspinous ligaments run from the tip of one spinous process to the tip of the next spinous process, attaching the low back vertebrae to one another. These are the most superficial ligaments you can feel. Together, they function as one continuous structure, but the individual segments can sustain separate injuries. Because they lie so close to the surface of the body, these ligaments are easy to palpate and treat.

Suprasacral Ligaments

The supraspinous ligaments continue all the way down the spine onto the sacrum. In this section, from S1 through S4, they are called suprasacral ligaments. As with the other supraspinous ligaments, these structures are superficial.

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Interspinous Ligaments

The interspinous ligaments lie deep to the supraspinous ligaments. They comprise the next layer of ligament tissue, attaching the deeper surfaces of the spinous processes to each other. These ligaments run from the base of one spinous process to another and can be one to two inches in depth, depending upon the size of the person. Because they are so deep, they cannot be treated manually. Unlike the supraspinous ligaments, the interspinous ligaments are NOT continuous from one vertebra to another.

Intertransverse Ligaments

The intertransverse ligaments attach adjacent transverse processes to one another. Their function is to provide support and to limit side-flexion and rotation. The intertransverse ligaments in the low back are a little less frequently injured than the other ligaments we will discuss.

Iliolumbar Ligaments

The iliolumbar ligament connects the transverse process of L5, and sometimes L4, to the anterio-medial superior lip of the crest of the ilium. The iliolumbar ligament helps to stabilize the link between the low back and the pelvis. This ligament is stretched when you side-flex the trunk. When you put your hand on your hip, your thumb is probably on the iliolumbar ligament.

Sacroiliac Ligaments

The sacroiliac joint joins the sacrum to the pelvis via the sacroiliac ligaments. The joint contains numerous ridges and depressions, indicating its function for stability more than motion. However, studies have documented that motion does occur at the sacroiliac joint; therefore, slight subluxations can and do occur. Stability is provided by the presence of many ligaments. These ligamentous structures offer resistance to shearing forces and distribute weight between the sacrum and the ilium, preventing excess loading of weight onto the low back.

There are three layers of sacroiliac ligaments: the deep anterior ligaments, the middle interosseous ligaments and the posterior sacroiliac ligaments. Each layer consists of thousands of fibers. The sacroiliac ligaments are perhaps the most frequently injured ligaments in the low back region. Many muscles in the low back, pelvis, buttocks, and posterior thighs have relationships with these ligaments and with the sacroiliac joint. The sacroiliac joint and its ligaments are pain-sensitive structures, richly innervated by nerve endings.

Sacrotuberous Ligaments

The sacrotuberous ligament is a powerful, flat, triangular ligament that connects the sacrum to the pelvis. It is attached by its broad base to the posterior inferior spine of the ilium, the lateral edges of the sacrum, and the coccyx. This ligament passes obliquely downward and inserts into the tuberosity of the ischium. The lower border of the sacrotuberous ligament is directly continuous with the tendon of the long head of the biceps femoris. We can easily palpate and treat this ligament.

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Sacrospinous Ligaments

The sacrospinous ligament is a thin, triangular ligament that is attached by its apex to the spine of the ischium, and attached medially to the lateral margins of the sacrum and coccyx. It is located in front of the sacrotuberous ligament, with which its fibers are intermingled. Together with the sacrotuberous ligament they form the greater sciatic notch. This ligament cannot be palpated, it is too deep to touch.

Coccygeal Ligaments

There are four coccygeal ligaments that cause untold amounts of pain. The lateral sacrococcygeal ligament can be felt on the lateral surface of the coccyx. The ventral sacrococcygeal ligament is on the anterior surface of the coccyx and is more difficult to palpate. The superficial dorsal sacrococcygeal ligament is on the posterior surface of the coccyx and is easily felt. Beneath it is the deep dorsal sacrococcygeal ligament, which is the deep layer on the posterior surface. Injury to these ligaments usually occurs as a result of an accident or a severe fall directly onto the coccyx.

Gluteal Fascia

The gluteal fascia is a thick layer of fascia that covers the gluteus muscles.

Muscles

- Quadratus Lumborum Muscle
- Iliopsoas Muscle
- Gluteus Medius, Minimus, and Maximus Muscles
- Piriformis Muscle
- Erector Spinae Muscles

Quadratus Lumborum

The quadratus lumborum muscle originates from the inferior border of the 12^{th} rib and has insertions at the transverse processes of the first four lumbar vertebrae and the posterior third of the iliac crest. This muscle performs several actions: it helps us breathe by fixing the twelfth rib in relation to the pull of the diaphragm, it laterally flexes the trunk, and it assists in extension of the low back with bilateral contraction.

Iliopsoas Muscle

The psoas muscle is attached to all five transverse processes of the lumbar spine, as well as to the lateral surfaces of the vertebral bodies. The iliacus muscle lines the inner surface of the pelvic bone and joins the psoas as it passes through the anterior pelvis. These two muscles converge

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and attach with a common tendon to the lesser trochanter of the femur, a protuberance at the base of the femoral neck. Together, these combined muscles flex the hip and help you sit up from a supine position. The psoas works most efficiently in hip flexion when the thighs' angle to the pelvis is more than 90 degrees.

Gluteus Muscles

The gluteus maximus, one of the largest and strongest muscles in the body, extends the hip. The gluteus maximus originates along the crest of the ilium and attaches to the posterior aspect of the femur. The gluteus medius and minimus, lie deep to the gluteus maximus. Like the gluteus maximus, gluteus medius and minimus also originate along the crest of the ilium but attach to the side of the femur and primarily abduct the leg. Various fibers of the gluteus muscles help each other with extension, abduction, adduction, and medial and lateral rotation of the hip. The upper gluteus muscles are covered by a thick fascia called the gluteal fascia.

Piriformis Muscle

The piriformis muscle originates at the anterior surface of the sacrum and passes through the greater sciatic notch to attach to the greater trochanter. It runs deep to the gluteus maximus muscle. The primary function of the piriformis muscle is to laterally rotate the hip.

Erector Spinae Muscles

The erector spinae muscle-group consists of hundreds of small, powerful muscles that flank the spine from the sacrum to the occiput — with each muscle spanning two, three, or more vertebrae. They work together primarily to side-flex the trunk and extend the spine. When the low back is injured, these muscles often react to the pain by chronically tightening.

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Anatomy Drawing

- Posterior Superior Iliac Spine, or PSIS.
- Ilium
- Spinous Processes: L5, L4, L3, L2, L1
- Sacrum
- Transverse processes: L1, L2, L3, L4, L5
- Coccyx
- Ischial Tuberosity

- Supraspinous Ligaments
- Interspinous Ligaments
- Suprasacral Ligaments
- Intertransverse Ligaments
- Sacroiliac Ligaments
- Ilio-lumbar Ligaments
- Sacrotuberous Ligament
- Coccygeal Ligaments

- Quadratus Lumborum Muscles
- Gluteus Medius Muscles
- Piriformis Muscles
- Greater Sciatic Notch

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Anatomy Palpation

- Spinous Processes: L5, L4, L3, L2, L1
- Supraspinous Ligaments
- Suprasacral Ligaments
- Posterior Superior Iliac Spine, or PSIS
- Ilium
- Iliolumbar Ligaments
- Erector Spinae
- Transverse Processes: L1, L2, L3, L4, L5
- Intertransverse Ligaments
- Coccyx
- Sacrum
- Sacrotuberous Ligaments
- Sacroiliac Ligaments
- Gluteus Medius Muscles
- Greater Trochanter

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DVD #2 – Assessment Tools

Assessment Tests

Assessment is a systematic method of gathering information to help you make the best possible decisions. Diagnosis is assigning a name or label to a certain group of pain phenomena or other symptoms. When you assign a name to a pain condition, you have given a diagnosis. Gathering information about someone's condition to determine how best to proceed or whether you should proceed is assessment, not diagnosis.

Indicators

- Pain
- Limitation of Movement
- Weakness
- Unusual Sensations or Loss of Sensation
- Abnormal Reflexes

General Principles

- Watch the Client's Face
- Normalize the Pain
- Ask "Does it hurt? If so, where?"
- Ask if the Client is Experiencing Pain Just Standing There
  - If yes, ask the person to let you know whenever the pain increases
- Go Gently at First

Testing Principles

- Movements that Create Pain
- Locations of Referred Pain
- Range of Motion
- Weakness
- Unusual Sensations or Loss of Sensation
- Reflex Abnormalities

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Assessment Tests

Inspection

Low Back Tests - Soft Tissue

Pain and Limitation:

1. Flexion
2. Extension
3. Side Flexion Right
4. Side Flexion Left

Weakness:

5. Heel Raises on One Foot

Lesions in the Hip Joint:

6. Passive Flexion of the Hip
7. Passive Lateral Rotation of the Hip
8. Passive Medial Rotation of the Hip

Pain and Limitation of Movement:

9. Straight Leg Raise

Compare the Length of the Legs:

10. Leg Length

Low Back Tests—Neurological

Relative Strength of the Right and Left Sides:

11. Resisted Flexion of the Hip at 90 Degrees (L3 L4 psoas muscle)
12. Resisted Flexion of the Hip at 180 Degrees (L3)
13. Resisted Dorsiflexion of the Ankle (L4)
14. Resisted Extension of the Big Toe (L4, L5)
15. Resisted Eversion of the Foot (L5, S1)

Diminished Ability to Feel Sensation:

16. Brush Test
17. Pin Prick Test

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Increased or Diminished Reflexes:

18. Knee Reflex (L3)
19. Ankle Reflex (L5, S1)

Cord Pressure:

20. Babinski
21. Ankle Clonus
22. Knee Clonus

Pain:

23. Quadriceps Stretch (L3)

Weakness:

24. Resisted Flexion of the Knee (L3)
25. Resisted Extension of the Knee (S1, S2)

Atrophy:

26. Gluteal Wasting (S1, S2)

Pain:

27. Palpation Supraspinous (L5, L4, L3, L2, L1, Suprasacral, Ilio lumbar, Sacroiliac, Sacrotuberous, Gluteus Medius)

Low Back Tests (with the specific structures you're testing in parentheses)

1. Flexion (lumbar and sacral ligaments and discs)
2. Extension (lumbar and sacral ligaments and discs)
3. Side Flexion Right (ilio-lumbar, lumbar ligaments, sacral ligaments, and L 4-5-S1 discs)
4. Side Flexion Left (ilio-lumbar, lumbar ligaments, sacral ligaments, and L 4-5-S1 discs)
5. Heel Raise on One Foot (S1 nerve root)
6. Passive Flexion of the Hip Joint (joint SI and hip joint)
7. Passive Lateral Rotation of the Hip Joint (joint SI and hip joint)
8. Passive Medial Rotation of the Hip Joint (joint SI and hip joint)
9. Straight Leg Raising (SLR) (lumbar and sacral ligaments, discs)
10. Leg Length Check (psoas muscle)
11. Resisted Flexion of the Hip Joint at 90 degrees (L3-4, psoas)
12. Resisted Flexion of the Hip Joint at 180 degrees (L3)
13. Resisted Dorsiflexion of the Ankle (L4)
14. Resisted Extension of the Big Toe (L4, 5)
15. Resisted Eversion of the Foot (L5, S1)

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16. Brush Test (diminished sensation)
17. Pin Test (diminished sensation)
18. Knee Jerk Reflex (L3)
19. Ankle Jerk Reflex (L5, S1)
20. Babinski (cord pressure)
21. Ankle Clonus (cord pressure)
22. Knee Clonus (cord pressure)
23. Quadriceps Stretch (L3)
24. Resisted Extension of the Knee (L3)
25. Resisted Flexion of the Knee (S1, S2)
26. Gluteal Wasting (S1, S2)
27. Palpation (L5, L4, L3, L2, L1, Ilio lumbar, Sacroiliac, Suprasacral, Sacrotuberous, Gluteus Medius)

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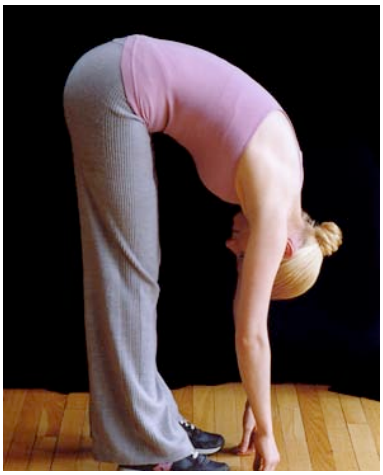
Low Back Test Descriptions

1. Flexion

Standing with her feet a few inches apart, the client bends forward slowly, stopping if and when she feels pain. If pain is felt, ask the client to point to the pain site.



2. Extension

Starting from the same position as in Test 1, the client bends back from the waist. Again, have the client stop and tell you if increased pain is produced, and ask her to point to where it hurts.

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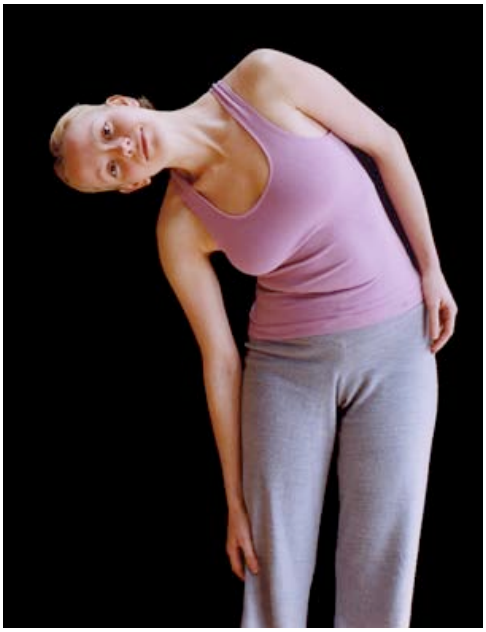
3–4. Side Flexions

While standing with the feet together, the client bends to the side as far as she can, stopping if pain is felt. Take note of where the pain is felt and then have the client bend to the opposite side.



5. Heel Raise on One Foot

Take the client's hands and ask her to stand on one foot, then rise onto the ball of that foot while you steady her balance. Notice how easy or difficult it is for her to rise up. Ask the client to repeat the same movement on the other side, and ask her whether one side felt weaker than the other.

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6. Passive Flexion of the Hip Joint

The client lies supine on the table. Lift one of the client's legs and gently press her knee into her chest, fully flexing the hip joint. Ask whether there is pain and stop if there is. Find out where the pain is felt. Repeat the same maneuver on the opposite side.

7–8. Passive Lateral and Medial Rotation of the Hip Joint

The client lies supine. Support the ankle with one hand and place the other hand on top of the knee. Lift the leg so that the thigh is vertical and the lower leg is parallel to the table. Now, rotate laterally as far as possible; if this is painless, give a slight jerk. Return to the neutral position, then rotate medially as far as possible before you give a jerk. (Normal range for lateral rotation is 90°, of range in lateral rotation, and normal range for medial rotation is between 45 and 60°.) Repeat on the other leg.

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9. Straight Leg Raising

The client lies supine. Placing your hand underneath the client's heel, gently lift the leg. The leg is relaxed but straight as you slowly lift it for at least 90º (to the vertical). Stop, of course, if pain is felt anywhere along the way. Repeat with the other leg. Note on which side of the back the pain is felt when each leg is tested.

10. Leg Length Test

Check the length of the legs with the client lying supine. Grasp the client's heels with your palms facing the ceiling and pull toward you for a moment. Be sure the person is lying straight on the table and line up the feet and legs with the center of the person's head. With your thumbs at the base of each ankle bone, draw the ankle bones together and check their relative length.

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11. Resisted Flexion of the Hip Joint at 90 Degrees

The client lies supine. Ask the client to raise her knee up so that her thigh is vertical. Place your hand just above her knee and ask her to forcefully pull her thigh toward her chest as you resist that motion. With this test and the resisted tests that follow, you are primarily checking for weakness. If there is pain on a resisted test, of course, take note of that as well. Repeat on the other side.

12. Resisted Flexion of the Hip Joint at 180 Degrees

As the client lies supine, place both of your hands on the client's thigh just above the knee. Ask the client to try and raise the leg against your resistance. Test both legs, checking for weakness.

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13. Resisted Dorsiflexion of the Ankle

Place one hand under the client's heel for support and your other hand on her forefoot just proximal to the toes. Ask the client to hold her foot in dorsiflexion and not to let you move it. Then you apply great force trying to pull the foot into plantar flexion.

14. Resisted Extension of the Big Toe

Ask the client to dorsiflex her foot and extend her toes, and then to hold them firmly in that position. Now, apply force with your index finger on top of her big toe, trying to pull it into flexion. Don't try to overpower the client; just match her strength and then pull a little harder.

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15. Resisted Eversion of the Foot

Place your medial hand under the client's heel for support and your lateral hand on the lateral edge of her foot, just proximal to the toes. Now, ask her to forcefully push outward (evert), from a dorsiflexed position as you push inward (medially) with equal force.

16. Brush Test

Using the brush in your reflex hammer, check the level and quality of sensation on feet and legs, brushing the big toe, the foot, the lower leg, and the thigh. (The idea is to compare similar areas on the left and right legs.)

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17. Pin Test

Using the pin in your reflex hammer, repeat as above, gently sticking the needle into the big toe, foot, shin, and thigh, alternating right and left legs and comparing the sensations.

18. Knee Jerk Reflex

The client lies supine. Standing at the client's right side, place your left hand under her right knee and bend it about 30º. Make sure the leg is relaxed. Holding the reflex hammer in your right hand, strike the patellar tendon below the kneecap and watch for the reflex. Now, reach across to the other knee and repeat the test (if you're left-handed—like the tester in the drawing—do the entire test from the other side).

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19. Ankle Jerk Reflex

The client lies supine. Stand at the foot of the table and gently place the foot in passive dorsiflexion; be sure the client is not *holding* the foot in that position. With the reflex hammer in your other hand, strike the lower Achilles tendon forcefully and watch for the reflex. Repeat on the other side (you can use the same hand if you stand in a slightly different position).

20. Babinski

The client lies supine. Place one hand above her ankle to hold it in place. For this test, the tool you'll use will be the handle end of your reflex hammer or a fingernail. Place it on the bottom of the foot, at the forward edge of the heel. With moderate force, scrape the sole of the foot and watch for the big toe to turn down. If the result of this test is positive, the big toe will curl into extension, indicating spinal cord pressure.

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21. Ankle Clonus

The client lies supine. Place one hand on the client's ankle to stabilize it, gently pressing it into the table. Now, place your other hand on the ball of her foot and forcefully press it into dorsiflexion. Count the number of involuntary beats. One or two are fine, but three beats indicates spinal cord pressure. Repeat on the other side.

22. Knee Clonus

The client lies supine. Place your hand above the knee, grasping the lowest portion of the thigh with your thumb and forefingers. Your hand should be facing her foot. Keeping your hand relaxed, suddenly grip and press simultaneously downwards and footwards, and watch for the involuntary beats of the kneecap.

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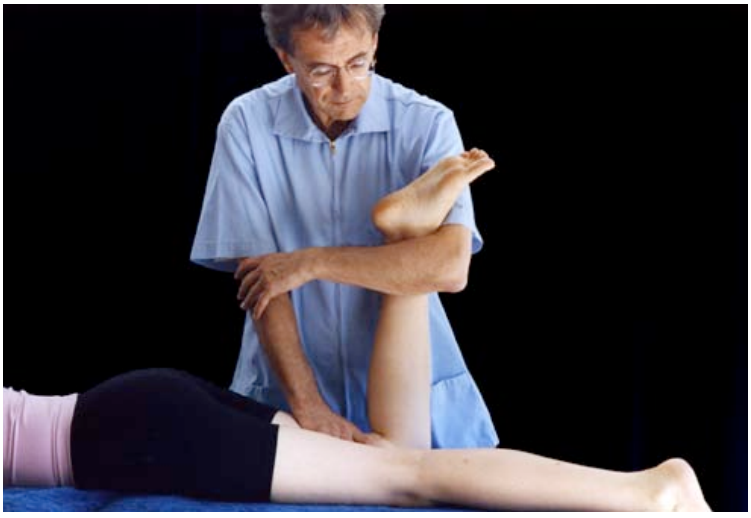
23. Quadriceps Stretch
The client lies prone. Stretch her quadriceps by gently pressing her heel into her buttock. Repeat on the other side.

24. Resisted Extension of the Knee

With the leg in the same position as above, wrap your hand around the front of the client's ankle and lunge forward toward the head to brace yourself. Now, ask the client to try to forcefully straighten the leg against your resistance. Compare the strength of right and left legs.



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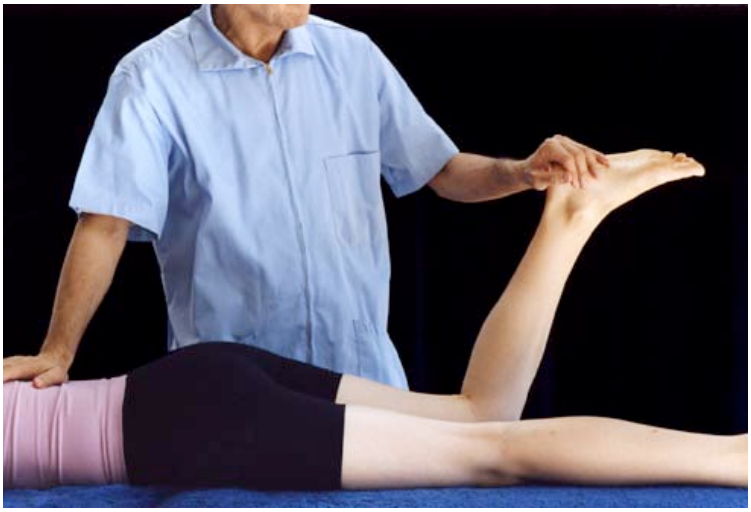
25. Resisted Flexion of the Knee

The client lies prone. Raise the client's lower leg so it is vertical. Place one hand on her heel and the other hand on her midback as a brace. Ask the client to hold the leg firmly in place as you forcefully try to straighten the leg. Overpower the client a bit to get a sense of her strength as compared with the other leg.



26. Gluteal wasting

Ask the client to squeeze her buttock muscles together as hard as she can and hold them that way. Place your thumbs on the lower part of the buttocks and your fingers above. Press your thumbs into the muscles with a squeezing action and compare the tensile strength of one buttock against the other. If one is wasted, your finger will go right in with no resistance.

27. Palpation

Palpate each ligament that you suspect is implicated in the pain.

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Taking a Low Back History

Taking a detailed history is important when assessing pain that originates in the low back. This is less true in other areas of the body, like the shoulder, where the testing procedures give you ninety five percent of the information you need. The frequency of pain, the pattern of occurrence over time, the dermatome patterns of any referred pain, and many other factors, all contribute to understanding a person's pain problem and the appropriate treatment.

How You Take the History

When taking a history, you're doing more than gathering information — you're also beginning to build a therapeutic alliance. In addition to learning details about the injury, you're also getting to know your client and figuring out how you can work most effectively with this person. At the same time, your client is getting to know you and getting a sense of how competent and trustworthy you are.

To establish a good therapeutic relationship, it's essential to have strong communication skills — including an ability to really listen, ask sensitive and pertinent questions, and show authentic empathy and compassion. Listen carefully, stopping periodically to paraphrase important information to ensure that you've understood what the client said.

Why are you here?

The client may be coming to see you about one pain problem or several different ones. People often don't give you all the relevant information at this stage of the interview.

Are there any other areas of pain in your body?

This question encourages the person to tell you about any other pain problems, which may or may not be related to their primary source of concern.

Have you seen a physician about this problem?

This is a very important question. When clients have not already seen a doctor for their pain problem, I always send them to one. For a client with low back pain, there are a number of serious medical issues to be considered that are beyond the knowledge base and scope of practice of a massage therapist or body worker. Low back pain occurs as one symptom in a number of different diseases, including endometriosis, kidney stones, prostatitis and various cancers affecting the kidneys and spine. To practice safely and responsibly, have every client see a doctor if they haven't done so already. Ideally, you can recommend a physician who not only has a high level of expertise, but also is skilled at establishing a rapport with patients.

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If yes, was there a diagnosis?

Getting a working diagnosis from a physician protects both you and the client. You can assess what you think is happening in order to guide what you do in your treatment sessions, but you cannot offer a diagnosis. Only a doctor can legally do that.

In many cases, the client will have had a radiological test such as an X-ray or an MRI. In reality, most common injuries will NOT be detected by these tests. However, there are several relevant conditions in the lumbar region that can be observed on a radiological test. These include:

- Disc erosion
- Fractures of the lumbar vertebrae
- The formation of an osteophyte, or bone spur
- An abnormal curve of the lumbar spine
- A misalignment of the vertebral joints

How old are you?

Different low back conditions are associated with different age groups.

What do you do for a living?

Here you're looking for clues as to possible causes of the pain or reasons why the level of pain has not diminished. For example, a person who delivers heavy packages, sits for long periods of time at a computer, or answers the phone all day may not be recovering because their work keeps straining the same area.

What do you eat for breakfast, lunch, and dinner?
What do you snack on?
Do you drink coffee or eat sweets on a daily basis?

A person's diet has a strong impact on their overall health and their ability to heal efficiently. Clients with poor dietary habits may benefit greatly from seeing a health professional who specializes in nutrition.

How much water do you drink each day?

If a person doesn't drink adequate amounts of water, they may be dehydrated without even realizing it. People who are dehydrated often have a diminished sense of thirst and so rarely feel thirsty. Each person's need for water is different, but the average is 6–8 glasses per day. Soup, juice, milk, soda, tea, and coffee don't count as water.

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Do you exercise regularly? If yes, how frequently?
What types of exercise do you do?

If a client does not exercise, try to find out why. It may be because of the pain they experience during or after exercise. If the client never exercised regularly, they may need some education about the role of exercise in maintaining a healthy body.

If the client continually gets hurt during exercise, they may be doing the wrong exercises for their body and their current condition, or they may be pushing themselves too much. The client may need some help learning which exercises are right for them, and how to exercise within their limits.

When did your pain first occur?

The client will often respond by telling you about the most recent incident of pain. Emphasize that you are asking about the very first time the person experienced low back pain.

Has the pain been relatively constant, or has it gone away and then returned a few days, weeks, or months later?
Has the frequency or duration of the painful episodes increased over time?

Different types of low back injuries are associated with different time lines.

Was your pain precipitated by an accident?

If it was, have the person describe the accident. With motor vehicle accidents, the nature of the impact often explains the type and severity of a person's injuries.

Did the pain come on slowly or suddenly?

When low back pain comes on slowly, it is generally the result of gradual wear and tear, poor alignment, faulty movement habits, or misuse of the body during a sport or a work activity. When the pain comes on suddenly, it is often associated with a specific incident. Either the incident alone was sufficient to cause damage, or it was the last straw in a series of occurrences that slowly weakened the structure and made it vulnerable to injury.

Where is your pain?

Have the person point with one finger to the area or areas that hurt, so you can get a clear idea of where the pain is located. This may help you to understand which structures are injured. The concept of referred pain is counterintuitive, and is difficult for most people to accept.

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Is the pain there all the time?

Here "all the time" means all day and all night, and in all positions. If the pain is there all the time, that means the injury is quite severe, and there's a greater chance that a disc is impinging on a nerve. Pain that comes and goes or disappears in certain positions generally indicates a less serious injury.

Is the pain sharp and intense or dull and achy?

If the pain is sharp, this tells you that the injured tissue is probably severely inflamed, and therefore you should go very slowly and gently while performing the testing procedures, the palpation, and the hands-on treatment. Sharp pain in the low back is generally caused by either a disc injury or a severe ligament or muscle injury.

When low back pain is just annoying, dull, or achy, this is usually a sign of less severe ligament injuries. Mild, multiple injuries to the low back ligaments and one of the gluteus muscles will cause a dull and achy pain that comes and goes.

What brings on your pain?

The answer to this question lets you know what positions or activities exacerbate the injury — and, in some cases, what the cause may have been. If the pain increases during the night or whenever the person lies down, check to see what position the person sleeps in. Frequently, when people wake up in pain or are awakened by pain during the night, they have been sleeping prone — which forces the low back into extension. If sitting brings on the person's pain, this indicates that sustained flexion stretches the pain-causing structure. If prolonged standing causes pain, this means that putting the low back in mild extension irritates the structure. During the treatment process, you want the client to be as comfortable as possible.

What makes your pain better?

The client may report that the pain subsides with rest, lying down, standing, sitting, walking, or exercise. If the answer is rest or lying down, this tells you that it's relatively easy to relieve the inflamed area, and that lying on the treatment table probably won't be painful for this client. If sitting is comfortable, this tells you that flexion or forward bending does not irritate the injury. If standing is more comfortable than lying down or sitting, this suggests that extension is more comfortable than flexion. If the person can exercise without pain, you can build on this in your treatment plan. This client will likely have no difficulty incorporating the therapeutic exercises that go along with the low back treatment and will feel a sense of participation, which is always helpful in the treatment process.

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Is your pain getting better, getting worse, or staying the same?

The response to this question will give you an indication of the severity of the injury and how the healing is coming along. If the person is steadily improving, you want to be sure that they continue doing whatever they're doing to facilitate the healing process. Your treatment will most likely accelerate the improvement that's already occurring. If the pain has stayed the same for a period of time, this indicates that a different approach is needed to restart the healing process. If the client is getting worse, this tells you that something is exacerbating their condition.

Does a cough make it worse?

A cough or sneeze can create tremendous pressure and stress throughout the low back. If a cough makes the client's low back pain worse, this indicates a fairly severe ligament injury or a nerve root compression — or both. Look carefully at the disc indicators, and also be on the lookout for a very sensitive, inflamed superficial ligaments.

Does the pain spread up your back or down your hip or leg?

Most low back pain is felt across the base of the low back. If the pain is traveling up the back, this means the person has either upper lumbar injuries, neck injuries, or thoracic injuries. Pain does not refer from the low back up to the thorax. However, pain is often referred down the hip or leg from the low back. The more severe the injury, the further the pain is referred. In addition to indicating the severity of an injury, the referred pain pattern may also help you determine which structure is likely to be injured.

Does the pain extend below your knee or into your foot?

Pain that extends below the knee or into the foot usually indicates a fairly severe injury.

Does the pain go around to your abdomen or into your groin?

Pain that goes to the lower abdomen, groin, or genitals is probably caused by the iliolumbar ligament. If the pain is deep in the abdomen and the person's internal organs have been thoroughly checked by a physician, the likely culprit is the iliopsoas muscle.

Have you had any treatment for your pain?
If so, what?
Did it help you?

You want to know what treatments the client has already tried, what worked, and what didn't. You can use this information to adapt your treatment plan accordingly. If the client is continuing to work with another practitioner, you might want to be in contact with that person so that you can coordinate your efforts.

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Do you have any numbness or numb-like sensations?
If so, where?

The answers to these questions will indicate the seriousness of the injury and the type of structures that may be involved. Actual numbness — a complete lack of sensation — is usually caused by a nerve root compression. However, numb-like sensations are usually caused by injuries to ligaments and other soft tissues.

Do you experience any pins and needles, tingling, or other unusual sensations?
If so, where?

These sensations give you information about which structures may be injured and about the way the client experiences pain or discomfort. Understanding the descriptive language of your clients can help you communicate effectively with each individual.

Do you have any aches and pains anywhere else in your body?

This is an important question for helping you understand the overall picture of the client's musculoskeletal health. Remember that we posed this question in another form at the beginning of the history. The person is likely to give you more information now, after becoming more comfortable with you. You may find out that the person has pain in many parts of their body, and just didn't think it was relevant.

Do you smoke?

People who smoke regularly, typically have a diminished capacity to heal.

Are you allergic to anything?

If the client is allergic to many things, check to see whether you need to use non-allergenic oils for this person. Allergies are sometimes an indication of nutritional deficit. If this is the case, you can refer the client to a specialist in that area.

Are there any other medical conditions I should be aware?

This question may provide information that is helpful during treatment.

Is there anything else you think I should know?

This is a broad question that does not pry, but gives the person an opportunity to share any other important pieces of information. Clients may then tell you about issues such as alcohol or drug addiction, or physical or sexual abuse.

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Are you taking any medications?

If the client is taking pain medications, you'll have to alter your treatment protocol to take that into account. During the assessment, the medications may diminish the intensity of the client's pain, masking the true extent of the injury. If the client is on pain-reducing medication during your treatment sessions, proceed very slowly. Be careful not to work too hard or too long. This question may also give you information about other conditions that the client neglected to tell you about.

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DVD #3 – Integration: Low Back Concepts and Theory

Referred Pain in the Low Back

Referred pain is pain that is experienced in a place distant from the lesion that is causing it. Low back injuries can refer pain to the abdomen, buttocks, anterior hip, groin, genitals, legs, feet, and toes. Everyone's referred pain patterns are similar, but not necessarily exactly the same.

Referred pain in the low back typically follows four basic guidelines according to Hackett's research:

1. Pain Refers Distally

The first guideline is that pain refers distally. Low back injuries generally refer pain from the midline to the periphery.

2. Referred Pain Does Not Cross the Midline

The second guideline is that referred pain does not cross the midline. An injury on the right side of the low back will refer pain into the right buttock and leg, but not into the left buttock and leg. If a client reports pain that travels from one side of the low back to the other, this means there are injuries present on both sides.

3. Pain is Referred Within a Dermatome

The third guideline is that pain is referred within a dermatome. Each spinal nerve innervates a specific region of the body, which is known as a dermatome. There are five dermatomes innervated by the lumbar spinal nerves. These regions include not just areas of the low back, but also areas of the groin, buttocks, and legs.

4. The Severity of an Injury in the Low Back is Directly Proportional to the Distance the Pain Refers

The fourth guideline is that the severity of an injury in the low back is directly proportional to the distance the pain refers. A serious low back injury might refer pain to the great toe or the heel, while a less severe injury only refers pain to the buttock or upper thigh.

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The Pathophysiology of Scar Tissue

Whenever we sustain an injury, our body must compensate for the damage. The ideal would be regeneration: the creation of new tissues that are identical to the old ones. However, in the human body, only a few types of tissue can truly replace themselves after an injury, and this only if the damage is not too severe.

For most low back injuries, instead of regenerating, the body undertakes a complex healing process that results in scar tissue. Scar tissue is a necessary and useful end product of the healing process. Without it, even minor damage to any body part would permanently debilitate our body. Scar tissue makes it possible for injured structures to maintain their integrity and continue to perform their functions.

Nevertheless, scar tissue is never an exact replica of the damaged tissue it is trying to replace. Even when it develops normally, it is generally denser and weaker than the tissue it replaces. Problems during the healing process can lead to the growth of abnormal adhesive scar tissue. Internal adhesions occur when scar tissue fibers develop inside an injured structure and link too densely with one another in random, unaligned patterns. This occurs frequently in the lower back and is the cause of the chronic nature of low back pain. External adhesions may form as layers of scar tissue grow outward from the injured area and attach themselves to nearby, healthy structures.

The three phases of the body's response to an injury clarify how scar tissue forms, what role it plays in the healing process, and why that process sometimes goes awry.

The Acute Phase

Beginning at the moment of injury and lasting for approximately four days, the body undertakes a phenomenal number of activities geared toward restoring the integrity of its tissues. In this acute phase, blood and lymph from torn vessels coagulate to seal off the injured area and help prevent the spread of infection. Intact vessels at and near the site of the injury dilate so that the body can deliver extra fluids and chemicals. This influx results in a gel-like substance collecting within and around the injured tissues. The gel contains binding factors that help to hold the injured tissues together.

In most cases, we experience inflammation — redness, heat, and swelling — as a result of these processes. Although inflammation is a normal part of healing, problems can arise if the internal swelling is excessive or lasts longer than necessary. In such cases, the gel becomes clogged with its binding factors, leading to the formation of abnormally dense scar tissue and/or adhesions between structures in the next healing phase, the rebuilding phase.

Another critical process that occurs in the acute phase is infection control. First, a specialized type of white blood cells attacks and digests the bacteria, reducing the chance of infection. Soon this job is taken over by other white blood cells, called macrophages, which digest not only bacteria, but also any dead tissue left behind from the injury. Macrophaages are also responsible for letting the body know how many repair cells, known as fibroblasts, will be needed during the

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next phases of healing. If infection and prolonged inflammation cause the macrophages to be overly active, an excessive number of fibroblasts will be called to the injury site. This, again, will lead to the formation of abnormal adhesive scar tissue.

The last major component of the acute phase is the laying down of new, fragile capillaries to replace the injured blood vessels. These begin to restore blood flow to the injured tissues in the affected area.

To support the healing process in the acute phase, it's important to monitor three vital processes that occur during this time: inflammation, infection control, and blood vessel re-growth. Apply ice, compression, elevate and rest, or the RICE protocol, to prevent inflammation and swelling from becoming excessive or lasting too long. Therapeutic massage may assist the movement of fluid surrounding the injured tissues so that swelling is kept to a minimum. The person should see a physician if there are any signs of infection — such as fever, increased inflammation, or pus. Gentle movement is important but excessive movement of the injured area should be avoided during the acute phase to help keep the new capillaries intact.

The Rebuilding Phase

The period from about four days to three or four weeks after an injury is known as the rebuilding phase. During this phase, the most important process is the production of collagen by the fibroblasts. In general, the collagen protein forms fibrils that connect with one another into fibers of various patterns, creating connective tissues throughout the body.

During the rebuilding phase, fibroblasts produce Type III collagen; Type I collagen, the primary component of scar tissue, forms later. Type I collagen is stronger than Type III, but neither of these collagens has the full strength of the tissues they replace.
The fibroblasts also pour lubricating substances into the fluid around the injured tissues. This lubricant helps the collagen fibers travel throughout the area to reach and rebuild the tissues. Within this fluid, the collagen fibers meet, line up, and form bonds with one another. For scar tissue to form normally, the proportions of collagen fibers and lubricating fluid must be just right. In a perfect scenario, this results in good, strong scar tissue without adhesions.

However, if extreme inflammation and swelling summoned too many fibroblasts and caused excessive binding factors in the injured tissues during the acute phase, these precursors will lead to the formation of internally adhesive scar tissue, and sometimes to external adhesions as well, in the rebuilding phase.

Having too little lubricating fluid is also a problem. Without enough fluid around them, the collagen fibers are unable to move easily through the injured area. Instead of lining up in parallel and binding normally, the fibers pile up haphazardly and form excessively dense connections with one another. The result is thickened scar tissue with internal adhesions.

During the rebuilding phase, it is vitally important to allow gentle movement of the injured region. Immobilizing the area at this time causes the lubricating fluid to be lost which prevents the collagen fibers from being able to disperse. This significantly contributes to the growth of

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abnormal scar tissue. Regularly performed mobilization of the area through a full and gentle range of motion — whether actively through exercise or passively with the help of a trained therapist — helps to maintain the fluid level. Additionally, the application of massage and friction therapy helps the collagen fibers to move, align, and join in a normal fashion.

The Remodeling Phase

Starting in the late rebuilding phase and continuing for six months or even a year after the injury, the body works to remodel the rebuilt tissues into as close an approximation of the original tissues as possible. Under normal conditions during this phase, the rate at which new collagen fibers are formed at the injury site slows down and becomes equal to the rate at which old collagen fibers are broken up and removed. The amount of scar tissue achieves a steady state and the scarring process stops. However, since new collagen is constantly replacing old, there are continuing opportunities for the scar to adapt to its surroundings.

Various factors affect how the remodeling collagen fibers line up with one another, and whether the resulting scar tissue develops densely, loosely, outside its original boundaries, or with adhesions. For our purposes, the most important factor is the amount of tensile-force or pulling-tension that is applied to the tissue during scar remodeling. This force can be applied either through mild stretching or contracting movements.

Scar tissue is less flexible than the tissue it replaces. However, properly formed scar tissue does not interfere with normal movement. In the presence of a full range of motion, with the application of appropriate tensile forces, the collagen fibers arrange themselves in an elongated formation, rather than a dense conglomeration. These long fibers are not capable of movement by themselves, but they can fold in on themselves when the surrounding healthy tissue shortens and lengthens as it extends. In this way, the elongated scar tissue mimics the movement of normal tissue. Evidence suggests that movement and tensile forces also result in a stronger scar.

To achieve optimal results, movement and tensile forces must be applied in the correct alignment. When movement and exercise are not done in proper alignment, haphazardly growing scar tissue adheres to adjoining tissues. Later, when normal movement is attempted, the adhesions repeatedly tear, re-form, and then tear again, causing chronic, recurring pain.

There are also other interventions that can facilitate the formation of healthy scar tissue. Some medical procedures are available from skilled physicians to help proliferate—that is, regenerate and replicate—tissues that suffer from laxity and chronic re-injury. A common and usually effective technique is cross-fiber friction. When applied by a skilled orthopedic massage therapist, friction therapy helps break apart old adhesive scar tissue and helps the new tissue develop in the correct alignment.

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Predisposing Factors

Predisposing factors, such as poor nutrition and lack of exercise, can make a person more vulnerable to injury. Keep them in mind not only when taking the history, but also while you're treating the client.

Poor Alignment and Postural Habits

Poor alignment and postural habits can have a profound effect on the health of the low back. The natural curves of the spine, especially the lordotic curve in the low back, act as a shock-absorbing spring when there is any impact through the spine. When we're young, up to the age of 25 or 30, this spring mechanism is in top form and can absorb approximately 2500 pounds of impact. This diminishes over time to 1500 pounds in middle age (between 30 and 50) and about 500 pounds when we get older (between 50 and 90). If we are very healthy - exercise regularly, eat well, and have low emotional and physical stress - the decline is slower.

An exaggerated lordosis disturbs the physics of the spinal spring mechanism. Running generates an impact of approximately five to seven times your body weight. That means if you weigh 150 pounds, each step of the run sends 750 to 1000 pounds of force through your body. In a well-aligned body this can be absorbed easily. However, if the low back is out of alignment, this amount of force often leads to a low back injury.

Most people slouch when they sit, allowing the pelvis to collapse posteriorly. Research shows that sitting creates even more pressure on the discs than standing. It also places a constant stretching force on all of the low back and sacral ligaments. If you're sitting in good alignment, your body doesn't suffer the same level of stress.

In addition to making us more vulnerable to injury, poor alignment and postural habits can also complicate and lengthen the recovery process. If your client has poor habits of posture or movement, it's important to address these issues to facilitate the healing process and prevent further injuries.

Stress

It is often useful to explain to clients how tension and stress impact the body's functioning on a physiological level. The hands-on work you do with clients directly influences their nervous system, helping to repair the chemical imbalances that may have developed in their bodies in response to stress. Helping your clients understand the impact of these chemicals will allow them to make more informed choices about how they take care of themselves.

Our nervous system is divided into two parts: the somatic nervous system controls voluntary action, intelligence, and decision making, and the autonomic nervous system functions as our "automatic pilot," controlling the basic processes that keep us alive. The autonomic nervous system includes two separate branches: the sympathetic and the parasympathetic. Together, they mediate the effects of stress on our body. The sympathetic branch helps us to respond to

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stressors, while the parasympathetic branch helps us to recover after the stressful event has passed or in general helps us to relax.

In a sympathetic response, our hearts pound, our blood pressure soars, our muscles tense up, and our body is flooded with adrenaline. There's nothing inherently bad about the sympathetic response to stress, so long as it occurs for short periods of time. The problems begin when stress starts to dominate our lives, so we remain in a state of sympathetic arousal well beyond a healthy limit. The result is that our bodies tire and deteriorate more quickly and become vulnerable to injury.

Although the adrenal glands secrete many different hormones during a sympathetic reaction, there are two that figure most prominently: adrenaline and cortisol. Adrenaline reinforces the fight or flight reaction by giving chemical orders all over the body to help us react quickly to threatening situations. Cortisol is secreted by the adrenal glands in response to long-term stress. When it is secreted in moderation, cortisol is a highly beneficial chemical that acts as a powerful anti-inflammatory agent. However, research has shown that when cortisol lingers in the body for prolonged periods of time, it weakens many types of tissue — especially bones, muscles, tendons, and ligaments. This raises the risk of chronic injuries in the back, neck, and other areas. Cortisol can also suppress the immune system, making us more vulnerable to getting hurt, and making it more difficult for us to heal when we are injured.

Muscle Tension

Chronic stress often translates into chronic muscle contractions in the back. Often, this tension is concentrated in the low back region — in particular, around the area where the pelvis meets the sacrum. This is where much of the weight of the upper body tends to fall, especially if there is poor alignment or any structural abnormalities. Following an injury, chronic muscle tension in the low back and pelvic region restricts circulation and slows the healing process.

Muscle tension can also make certain injuries more likely to occur. In particular, there is an important link between muscle tension and ligament sprains. It is normal for the spaces between the intervertebral discs to narrow somewhat with age, as the discs harden over time. Often, however, excess tension in the erector spinae muscles causes these spaces to narrow prematurely. If these muscles are chronically tense, they constantly exert a compression force even greater than that of gravity, and therefore squeeze the vertebrae more forcefully together. Such unnatural compression leaves the supporting ligaments that surround the discs in a routinely slackened state. If a ligament goes slack for any significant period of time, it begins to weaken and atrophy. When a weakened ligament is repeatedly called upon to perform quick, sudden actions, it will stretch or tear slightly.

Problems With Sleep

In healthy individuals, sleep is a time of restoration and healing. When a person has difficulty sleeping, or when their sleep is not restorative, the healing process may be compromised.

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Poor Nutrition

Eating balanced meals plays a major role in supporting recovery from an injury and preventing further injuries from occurring. In particular, an injured person should be careful to drink plenty of water and eat adequate amounts of protein, which is necessary for rebuilding damaged tissues. Deficiencies in any essential nutrients will result in a diminished capacity to heal.

Lack of Exercise

Staying active helps to maintain our strength, flexibility, and cardiovascular fitness, as well as the health of our joints. People who don't exercise regularly are much more vulnerable to injury.

Spondylolisthesis

Spondylolisthesis is a condition involving misalignment of one or more vertebrae. A vertebra may be a quarter-inch to a half-inch out of alignment, anteriorly or posteriorly. Spondylolisthesis can make a person significantly more vulnerable to injuries to the spinal ligaments and discs. This condition most commonly occurs in the low back region.

Osteoarthritis

Osteoarthritis, also known as degenerative joint disease, is a very common form of arthritis. This condition is characterized by the degeneration of cartilage and the formation of abnormal bony growths, which block the normal functioning of a joint. Osteoarthritis in the spine may decrease the range of motion in the low back, making it more likely that the low back ligaments will be injured.

Hormonal Changes

Low back ligament injuries occur more frequently during pregnancy, when a woman's body produces a hormone that loosens all of her ligaments. This allows for greater movement of the pelvic and sacral bones — which helps make room for the growing fetus, but also makes ligament sprains throughout the body more likely, particularly in the sacroiliac area. The hormonal changes produced by menstruation and menopause can also have an impact on low back pain.

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General Concepts: Disc & Ligament Injuries

Lesion

Lesion is a general medical term for an injury or dysfunction in any tissue.

Nerve Root Lesion

A nerve root lesion, also known as a nerve root compression or radiculopathy, is what the general population refers to as a pinched nerve. This condition is usually caused by compression of the root of the nerve by a damaged, protruding disc.

Paresis

Paresis is the medical term for motor weakness. There are two distinct categories of weakness: specific and generalized.

Specific Weakness

In specific weakness, an impingement of a particular nerve causes weakness and atrophy in all the muscles controlled by that nerve. Specific weakness does not develop until some time after the appearance of pain & limitation.

Generalized Weakness

In contrast to specific weakness, which affects a limited subset of muscles, generalized weakness affects many different muscle groups — sometimes on both sides of the body. During the assessment, this will show up as weakness on many of the resisted tests. Here the cause is disuse, rather than nerve root compression. Generalized weakness of the legs is relatively common in clients with low back injuries. As everyday physical activities begin to cause pain, people tend to significantly limit these movements, leading to muscle atrophy.

Ligament Laxity

When a ligament is lax, it is longer than it should be. It may be due to a congenital reason - a person may be born with ligaments that are too long, or it may occur due to injury. A severe injury can instantly stretch the ligament, or a series of chronic injuries can cause the formation of scar tissue which stretches within the ligament over time.

Segmental Weakness

Segmental weakness is laxity of the ligaments that attach two of the vertebrae at a particular level - for example, the low back ligaments attaching L4 to L5. This makes that particular spinal joint unstable, and makes it more likely that a sudden movement will “yank” the ligament and cause damage.

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Post-traumatic Adhesions

Post-traumatic adhesions are bands of fibrous scar tissue that develop in an injured area. They commonly occur in the gluteus medius muscles of the buttock after an accident that injures the sacroiliac ligaments. People often experience this injury as lateral buttock pain.

Paresthesia

Paresthesia is the medical term for a feeling of pins and needles, or tingling. This can occur when there is pressure on a nerve trunk or an artery.

Dysthesia

The term dysthesia refers to an odd, distorted sense of touch, and is generally associated with a connective tissue injury. Examples include:

- thermal distortions in which a person experiences pain when they come in contact with warm or cool surfaces
- creepy-crawly feelings across the low back
- a pulling sensation in the front or back of the hip
- a constant sense of buzzing in a part of the body
- a feeling of swelling that is not physically there
- an uncomfortable burning sensation going down the leg

Cutaneous Analgesia

Cutaneous analgesia is the medical term for a "numblike" sensation. This is much more common than complete numbness. Often clients will report that a thigh is numb, when in reality it is numb-like. When you touch the thigh, they'll be able to feel it. If the thigh were actually numb, the person would feel nothing at all when touched.

Cutaneous Anesthesia

Cutaneous anesthesia is complete numbness, or lack of sensation. This does not usually occur in the low back itself, but it may happen in the thigh, low leg, foot, or toes. When a client reports numbness, confirm it by trying to touch the area with a brush or a finger to see whether there's really no sensation or just diminished sensation.

Lumbar Spondylosis

Lumbar spondylosis is a general term referring to chronic degeneration of the vertebrae and discs in the low back. This condition is most likely caused by wear and tear on the structures in the back over time. It usually appears in individuals over 40, and progresses with age. A variety of changes to the vertebrae and discs may accompany spondylosis, including: the formation of osteophytes, or bone spurs, which may cause no symptoms, or may put pressure on the spinal

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nerves; joint narrowing from disc erosion; lumbar disc lesions, which cause low back, thigh, leg, and foot pain; weakness; and other symptoms.

Cancer

Earlier I talked about how important it is to have each client see a physician before beginning treatment with you. If someone does have cancer, it's important to determine this as soon as possible, and only a doctor can make that diagnosis. In a medical setting, you might hear technical terminology related to cancer. Neoplastic erosion is a hole in a bone caused by cancer. When cancer spreads from one site to another, the growths at the new location are called secondary deposits. In a client with cancer, you may notice a few unusual signs while taking the history and performing your assessment:

- The client reports steadily increasing pain that is not related to exertion.
- Assessment tests reveal bilateral weakness or injury to multiple nerve roots (this would be unusual in cases of disc injury).
- While the neurological signs are severe, the pain caused by nerve root pressure is minor. (The opposite is true with disc lesions.)

Facet Syndrome (Zygapopheseal Syndrome)

The proper name for the joints commonly called facet joints is zygapopheseal joints. These are small synovial joints, and - like other synovial joints - they can become inflamed.

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Theory and Integration – Injury Profiles

To effectively assess injuries in the low back region, you need to be able to discriminate between a ligament lesion and nerve root compression caused by injury to a disc. Less than 5% of low back injuries are caused by nerve root compression. The overwhelming majority of injuries to the low back involve the low back and pelvic ligaments and the gluteus medius muscle.

Differentiating a Ligament Injury from a Disc Injury/Nerve Root Compression

Ligament Injury	Disc Injury/Nerve Root Compression
Slow, achy, diffuse pain; can be sharp if injury is severe	Severe, sharp, electric pain
Proximal pain	Distal pain
Pain referred within dermatome (some exceptions)	Pain referred within dermatome
Pain that switches sides Pain on right and/or left	Pain on one side only
Pain that comes and goes	Constant pain
Numb-like sensations	Confirmed numbness
No loss of sensation	Diminished or loss of sensation
Tingling sensations	Pins and needles sensations
No specific weakness	Weakness in one segment
Normal reflexes	Diminished or absent reflexes in L3, L5, S1, and S2
Limitation of movement caused by pain	Asymmetrical limitation of movement caused by involuntary muscle spasm in reaction to pain
Soft or spongy end feel	Hard end feel
Local and referred pain on palpation of ligaments.	No pain on palpation unless ligaments are also injured.

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Both ligament and disc injuries cause pain, but the quality of the pain is different. Nerve root lesions tend to cause a severe, sharp, almost "electric" kind of pain. The pain from ligament lesions tends to come on more slowly, and typically is relatively diffuse and achy. However, the pain may be sharp if the injury is severe.

Another difference between disc and ligament lesions involves the part of the corresponding dermatome to which pain is referred. Disc lesions often refer pain only to the distal part of the dermatome - without pain in the proximal part. Ligament lesions, on the other hand, tend to refer to the proximal part of the dermatome, but not to the distal part. This rule doesn't always hold true, but it can be a useful guide in making the disc-versus-ligament distinction.

Pain is generally referred within a single dermatome. Therefore, if a person feels pain in multiple dermatomes, it's likely that multiple injuries are present. Another factor differentiating ligament lesions from disc lesions is the distribution of pain on one or both sides of the low back and legs. If the pain switches from the right side of the low back to the left or is felt on both sides, it is likely to be caused by ligament sprains. With a disc lesion, the pain is only felt on one side. In addition, pain caused by nerve compression tends to be fairly constant. With a ligament injury, the pain usually comes and goes.

If a ligament is injured, there may be some numb-like sensations, but not complete numbness. The person can tell when they are being touched. With a disc lesion, actual numbness may occur in a specific area of the skin. The area may feel numb-like for a short while as the numbness comes on with a disc injury. An injured disc may also produce a feeling of pins and needles that is fairly constant. An injured ligament may produce odd tingling sensations that come and go.

The symptoms of weakness and changes in reflexes are some of the most important factors distinguishing ligament lesions from disc lesions. If there is a disc compression, weakness will occur at only one level of the spine, affecting only those areas innervated by those nerves. These corresponding muscles may be noticeably atrophied as well. In cases of ligament injury, you won't see this type of specific weakness. If there is muscle weakness, it will be a generalized weakness due to disuse stemming from the pain. With a low back ligament injury, you also won't see any reflex changes in the leg. If a disc is injured, there may be diminished or absent reflexes in the knee or ankle.

Another telling aspect of an injury is the nature of the limitation of movement it causes. Disc lesions result in an asymmetrical pattern of limitation. In these cases, moving in one direction - and not the other - causes pressure on the nerve root. When the body starts moving in the direction that compresses the nerve, an involuntary muscle spasm occurs to prevent this from happening. This often results in a hard stop to the movement. In contrast, the limitation caused by a ligament sprain is not usually asymmetrical, and is caused by avoidance of pain rather than by an involuntary muscle spasm. The full range of motion will generally still be possible, although it may be very uncomfortable to accomplish. The feeling at the end of the movement will be soft and spongy, not hard.

A final indicator is whether or not ligament palpation is painful. With disc lesions, ligament palpation doesn't cause any pain — unless the ligaments are injured as well. With ligament

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lesions, palpating the relevant ligaments does cause pain — unless the lesions are very deep and cannot be palpated.

Always keep in mind that it's quite possible - and in fact quite likely - that a person who has a disc lesion will also have ligament lesions. The ligaments are part of the structure that holds the discs in place. At times, the ligament injuries may be producing more of the pain than the disc injury.

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Injury Profiles

Ligament Injuries

The most important thing to note about ligament injuries in the low back is that they are extremely common. Ligament injuries often lead to chronic pain due to poorly formed adhesive scar tissue. This has much less strength and uniformity of structure than the original tissue it replaces and is therefore vulnerable to being re-torn again and again, causing increasing pain. Hands-on friction therapy, together with daily gentle movement, can help eliminate adhesive scar tissue and prevent it from re-forming.

The low back ligaments that get injured most often are the sacroiliac ligaments. Other commonly sprained ligaments include the iliolumbar ligaments, the sacrotuberous ligaments, and the supraspinous ligaments at L4 - L5 and L5 - S1. The remaining low back ligaments, including the intertransverse ligaments, the supraspinous ligaments from L1 to L4, and the suprasacral ligaments covering the central part of the sacrum, get injured less frequently. Frequently you'll find that many ligaments are injured simultaneously. As your treatment progresses, the low-level ligament lesions will heal quickly, making it more obvious where the serious sprains are located. In some cases, ligament lesions co-exist with injuries to other structures. Some clients have both disc and ligament lesions. Treating the ligaments will help clarify how much of the pain is coming from the ligaments versus the compressed nerve roots.

Assessment Profiles of Specific Ligament Injuries

There are three different kinds of indicators: Major Indicators, Auxiliary Indicators, and Minor Indicators. Major indicators, also called major signs, provide the most important data about an injury. Auxiliary indicators are helpful in steering you toward the correct conclusion, but are not as definitive as major indicators. Minor indicators, or minor signs, are test results that are potentially confusing, but are not usually present in cases of low back pain. Together with the pain patterns reported by the client, information about major and auxiliary indicators will help you figure out exactly which structures have been damaged.

Supraspinous Ligament Sprains in the Lumbar Spine

- Major Indicators:
  - Pain and limitation on flexion and/or extension of the low back
  - Referred pain into the legs, roughly along the dermatomes
- Auxiliary Indicator:
  - Local pain on palpation
- Treatment:
  - Friction therapy, myofascial therapy, massage therapy, exercise, or injection therapy

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Injuries to the supraspinous ligaments are extremely common. Sitting for prolonged periods of time, especially in a slouched position, places constant tension on the supraspinous ligaments in the lumbar region, as does prolonged standing in a poorly aligned position, such as if the lower spine is habitually in extreme lordosis. Alternatively, supraspinous ligament tears may be caused by a traumatic incident such as a motor vehicle accident, lifting an unusually heavy object, or a severe fall.

The most commonly injured supraspinous ligaments in the low back are those between L4 and L5 and between L5 and S1. This area is the most vulnerable part of the lower spine, where the majority of our body weight falls. It is also where most low back disc lesions occur.

The major indicators for injury to the supraspinous ligaments in the low back are flexion and extension performed in the standing position. A supraspinous ligament may be injured at its center, at its right or left edge, or throughout the entire structure. Palpation will help you to locate the precise area of injury. The pain caused by a supraspinous ligament injury may be local or referred. If it's local, there may be a small area of pain right near the injured ligament. If it's referred, the pain may extend to the buttock, down the thigh, to the lower leg, foot, and toes.

Iliolumbar Ligament Sprains

- Major Indicators:
  - Pain on side-flexion and sometimes on flexion and/or extension
  - Referred pain to the low back, buttock, lower abdomen, groin, upper lateral thigh, and/or genitals
- Auxiliary Indicator:
  - Local pain on palpation
- Treatment:
  - Friction therapy, myofascial therapy, massage therapy, exercise, or injection therapy

Injuries to the iliolumbar ligaments are fairly common, sometimes appearing alone but more often occurring in combination with other ligament lesions. Iliolumbar ligament injuries often occur while shoveling snow, digging in the garden, or performing other activities that involve simultaneous lifting and twisting motions. They may also be the result of a traumatic incident of some kind. The most common site of injury is right where the ligament attaches to the ilium.

The most important indicator for injury to the iliolumbar ligament is side-flexion. Often, forward flexion and extension are also painful. Sometimes the person has limited side-flexion and we need to vary the test to get a positive result. Having the client bend slightly forward or backward to perform side-flexion often permits more movement and helps reveal the injury.

In people whose iliolumbar ligaments are injured, prolonged sitting is usually quite painful. If only one side is affected, pain is felt across the superior edge of the ilium on that side. If both

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sides are affected, pain may be felt straight across the low back. Often, after one of the ligaments gets injured, the person tries to compensate for the pain and ends up causing a new, less severe injury on the other side. This results in the common finding that pain is felt on both sides of the low back, but more strongly on one side than on the other. An iliolumbar injury can also refer pain more distally, to the upper buttock, the lateral hip and thigh, the lower abdomen, the groin, and the genital region. This injury can be a particularly scary experience when pain is referred to the genital region.

Sacrotuberous Ligament Sprains

- Major Indicators:
  - Pain on flexion
  - Pain felt locally and pain referred straight down the back of the thigh and calf, sometimes into the bottom of the heel (Another major indicator is pain felt locally and pain referred straight down the back of the thigh and calf, and into the heel.)
- Auxiliary Indicator:
  - Local pain on palpation
- Treatment:
  - Friction therapy, myofascial therapy, massage therapy, exercise, or injection therapy

Although injuries to the sacrotuberous ligaments are relatively common, they are often overlooked or misdiagnosed by health care practitioners. They usually appear along with other ligament injuries, but they may also occur alone. Typically, these structures are injured slowly through wear and tear, but damage may also occur suddenly through an accident or an unusual strain. This large, strong ligament is easy to palpate and to treat.

The most common site of injury is where the sacrotuberous ligament attaches to the sacrum. This injury is frequently present on both sides, but is usually worse on one side than the other.

Prolonged sitting is often painful, with the pain felt in the medial upper buttock on the affected side or sides. When the pain is referred, it is felt straight down the back of the thigh and calf to the heel of the foot. The major indicator for a sacrotuberous ligament injury is forward flexion.

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Sacroiliac Ligament Sprains

- Major Indicators:
  - Pain and limitation on flexion and/or extension, sometimes pain and limitation on side-flexion
  - Local and referred pain sites
- Auxiliary Indicator:
  - Local pain on palpation
- Treatment:
  - Friction therapy, myofascial therapy, massage therapy, exercise, chiropractic or osteopathic manipulation, cranio-sacral or injection therapy

Injury to the ligaments of the sacrum can cause devastating low-back, buttock and leg pain, and the sacroiliac ligaments are the most frequently injured structures of the low back. Tears and adhesive scarring of these ligaments account for the great majority of low-back, hip, and so-called "sciatic" pain down the leg. Sacroiliac injuries are occasionally caused by one specific incident, but more often than not the pain appears very gradually over a period of time.

The sacroiliac ligaments consist of thousands of individual fibers that are deeply layered for about one-and-a-half to two inches. Together, they connect the sacrum to the ilia, helping to stabilize the back of the pelvis.

The most important indicators for sacroiliac ligament sprains are pain and limitation on flexion and/or extension. Sometimes there will be pain and limitation in side-flexion as well. A sacroiliac injury may cause a false positive on two of the hip tests. Pain on passive medial rotation or passive flexion of the hip joint usually indicates a hip joint problem. However, passive flexion may inadvertently put the low back into flexion, and medial rotation may pull on the sacrum and its ligaments. When this occurs, isolate the hip by having the client put their fist under the small of their back on that side while you perform these tests. This will prevent the low back from being stressed while you test the hip joint.

Pain caused by injury to the sacroiliac ligament typically follows one of four common patterns:

- Sudden onset, then no pain
- Slow onset with increasing frequency of painful episodes
- Excruciating pain, fixed in deviation, slowly diminishing over time
- Chronic pain, either mild or severe

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Coccygeal Ligament Sprains

- Major Indicators:
  - Pain felt locally (coccygodynia)

- Auxiliary Indicator:
  - Local pain on palpation

- Treatment:
  - Friction therapy, myofascial therapy or injection therapy

There are four coccygeal ligaments that are very painful when injured. Two of them are accessible to treat manually, and the other two are not. The lateral sacrococcygeal ligament can be treated manually because it is fairly superficial on the lateral surface of the coccyx. The superficial dorsal sacrococcygeal ligament is on the posterior surface of the coccyx and can also be easily felt and treated. The ventral and deep dorsal sacrococcygeal ligaments lie very deep and are more effectively treated by other means. Injuries to the coccygeal ligaments are relatively uncommon compared with other types of low back injuries. Coccygeal injuries often occur from being kicked in sports, falling while skiing, or falling from a bike or a horse. Women are five times more likely to sustain these injuries, because the female coccyx is more exposed and prominent. In addition, the coccygeal ligaments can be injured during childbirth.

Often a coccygeal ligament injury occurs by itself, but it may also occur in combination with other low back ligament sprains. Some of the fibers of the gluteus maximus muscle are attached to the coccyx, and these may be bruised or torn by direct impact.

In addition to injuries of the coccygeal ligaments, there are four other possible causes of local coccygeal pain:

1) Strain of the coccygeal fibers of the gluteus maximus muscle at their attachment to the coccyx. When this occurs, walking may be uncomfortable on the affected side. This injury responds well to massage and friction therapy.

2) A bone bruise or contusion at the tip of the coccyx. This often heals well with several months' rest. It can also be treated by injection therapy.

3) Sprain of the posterior sacrococcygeal joint. This can be effectively treated by injection. Hands-on treatment can make it worse.

4) A nerve root compression that refers pain to the coccyx. This type of injury is relatively uncommon. In this case the client will feel pain during standing and walking as well as sitting, and there will be no pain on palpation.

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Nerve Root Compression

Nerve root compression causes fewer than 5% of low back injuries. There are a number of contributing factors that can lead to disc injuries, and therefore to nerve root compression. Discs are often damaged by severe falls and motor vehicle accidents. The impact ruptures the disc, resulting in severe pain. When ligaments are loose due to genetic factors, repeated trauma, or gradual wear and tear, the discs are more likely to rupture and protrude. As we age, the liquid content of our discs decreases which diminishes their flexibility and shock-absorbing capacity. Constant stress on the muscles of the spine increases the compression forces acting on the discs. This, in turn, slackens and gradually weakens the ligaments, making the person more vulnerable to disc injury. Different body positions place differing levels of stress on the discs. The stress is greatest in a sitting position, somewhat less in standing, and least in a lying down position. When we sit, the forward flexion of the spine places the spinal ligaments on a stretch, and forces the discs in a posterior direction. This places tremendous pressure on the disc structure.

Assessment Profiles of Nerve Root Compression at Each Level

There must be a constellation of symptoms - not just one or two - to make a determination of a disc lesion. Ligament injuries often cause some similar symptoms, including pain and limited movement. REMEMBER: Identifying a disc injury is ultimately the job of a physician.

Correspondence of Discs to Nerve Roots

At most levels of the spine, there is a one-to-one relationship between the discs and the nerve roots they compress. However, at levels L3, L4, and L5, the relationship isn't that simple. Because the spinal cord ends at L2, the nerve roots hang side-by-side below this level. Therefore a disc can sometimes compress a nerve root at a different level, or compress two roots at the same time. Disc lesions pressing on more than one nerve root are called polyradicular as opposed to monoradicular.

This table illustrates the various possibilities according to Dr. Cyriax.

Disc	Roots It Can Compress
L4	L4 root alone L5 root alone L4 & L5 roots together S3 or S4 roots alone or together
L5	L5 root alone L5 & S1 roots together S1 root alone S1 & S2 roots together S2, S3 or S4 roots alone

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Major Indicators of Disc Injuries

- Assessment Test Results
  With each of the nerve root injuries, orthopedic testing will reveal asymmetrical limitation of movement caused by involuntary muscle spasm. That means there will be much greater pain and limitation of movement in one direction than in the opposite direction.

- Numbness
  Compression of different nerve roots in the low back will cause numbness in different parts of the body — from the groin down to the foot and toes. The loss of sensation appears in two basic stages: the sensation of light touch (tested with a brush) diminishes first, and the sensation of deep touch (tested with a pin) diminishes second. Likewise, on recovery, the sensation of deep touch returns before the sensation of light touch.

- Pain
  Nerve root compressions also produce distinctive pain patterns. Remember that the pain will occur only on the side of the body where the disc is protruding. If a client has pain on both the right and left sides, the likely cause is a ligament injury — NOT a disc injury.

- Weakness
  Most disc injuries cause identifiable weakness in one or more locations. Unlike the generalized weakness associated with ligament injuries, this is specific weakness, affecting only the muscle or muscles innervated by one particular nerve. The weakness develops gradually over time, as the result of muscle atrophy. It usually takes at least three months of atrophy for leg or foot weakness to become noticeable.

- Changes in Reflexes
  Depending on the level at which it occurs, a nerve root compression in the low back can cause a change in the knee or ankle reflex. This symptom may occur suddenly or develop slowly over many months — depending on the circumstances. A sudden change may be due to an accident or other severe trauma, while slow progression may result from a disc protrusion that develops over a long period of time.

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Specific Nerve Root Compression Profiles

L1 Nerve Root Compression

- Major Indicators:
  - Assessment Test Results: Pain and limitation on side-flexion, right or left
  - Numbness: Groin
  - Pain: Upper portion of the low back; Lower abdomen
  - Weakness: None
  - Changes in Reflex: None
- Treatment:
  - Rest, Time, or Surgery

L2 Nerve Root Compression

- Major Indicators:
  - Assessment Test Results: Pain and limitation on side-flexion right or left
  - Numbness: Anterior thigh
  - Pain: Upper portion of the low back; Anterior thigh
  - Weakness: Psoas muscle
  - Changes in Reflex: None
- Treatment:
  - Rest, Time, or Surgery

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L3 Nerve Root Compression

- Major Indicators:
  - Assessment Test Results: Pain and limitation on side-flexion right or left; Pain on bilateral passive knee flexion (pulls on the nerve root)
  - Numbness: Anterior thigh; Anterior lower leg; Inner portion of the knee
  - Pain: Low back on the affected side; Upper buttock; Anterior thigh; Anterior lower leg
  - Weakness: Psoas muscle; Quadriceps muscles
  - Changes in Reflex: Knee reflex
- Treatment:
  - Rest, Time, or Surgery

L4 Nerve Root Compression

- Major Indicators:
  - Assessment Test Results: Pain and limitation on side-flexion right or left; Pain and limitation on the straight leg raise; Foot drop
  - Numbness: Lateral thigh; Lateral lower leg; Anterior shin; Medial foot; Great toe
  - Pain: Low back; Medial buttock; Lateral thigh; Lateral lower leg; Great toe
  - Weakness: Tibialis anterior; Extensor hallucis
  - Changes in Reflex: Knee reflex
- Treatment:
  - Rest, Time, or Surgery

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L5 Nerve Root Compression

- Major Indicators:
  - Assessment Test Results: Pain and limitation on side-flexion right or left; Pain and limitation on the straight leg raise
  - Numbness: All of the toes, especially the 3 medial toes, the great toe and second and third digits
  - Pain: Low back; Lateral thigh; Lateral lower leg; The three medial toes
  - Weakness: Gluteus medius (there is often visible atrophy); Extensor hallucis; Peroneus muscles
  - Changes in Reflex: Ankle reflex
- Treatment:
  - Rest, Time, or Surgery

S1 Nerve Root Compression

- Major Indicators:
  - Assessment Test Results: Pain and limitation on side-flexion right or left; Pain and limitation on the straight leg raise; Gluteal wasting
  - Numbness: Lateral lower leg; Lateral toes; Lateral foot
  - Pain: Posterior lower leg; Lateral toes; Lateral foot
  - Weakness: Hamstrings; Gastrocnemius; Soleus; Peroneus muscles
  - Changes in Reflex: Ankle reflex
- Treatment:
  - Rest, Time, or Surgery

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S2 Nerve Root Compression

- Major Indicators (MI):
  - Assessment Test Results: Pain and limitation on side-flexion right or left; Pain and limitation on the straight leg raise; Gluteal wasting
  - Numbness: Posterior thigh; Lateral lower leg; Heel of the foot
  - Pain: Posterior lower leg; Lateral foot; Lateral toes
  - Weakness: Hamstrings; Gastrocnemius; Soleus
  - Changes in Reflex: Ankle reflex
- Treatment:
  - Rest, Time, or Surgery

S3 Nerve Root Compression

- Major Indicators:
  - Assessment Test Results: Pain and limitation on side-flexion right or left
  - Numbness: Perineum; Groin; Medial thigh
  - Pain: Groin; Medial thigh; Perineum
  - Weakness: None
  - Changes in Reflex: None
- Treatment:
  - Rest, Time, or Surgery

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S4 Nerve Root Compression
This condition is rare but serious. If you notice this constellation of symptoms, have the client see a physician immediately.

- Major Indicators:
  - Assessment Test Results (sometimes, but not always): Bilateral thigh and leg pain; Impotence
  - Numbness: Perineum
  - Pain: Perineum; Both thighs and legs; Genitals (often with pins and needles)
  - Weakness: Bladder; Rectum
  - Changes in Reflex: None
  - Additional: Rectal spasm; Pins and needles in entire saddle area
- Auxiliary Indicator: There is difficulty passing or retaining urine and the rectum lacks expulsive power
- Treatment:
  - Immediate Surgery

Treatment for Disc Injuries

For a person with an S4 nerve root compression, the only appropriate treatment is surgery — which must be done as soon as possible. For other disc injuries, surgery may sometimes be required, but often the symptoms subside with time and rest. Once a disc has been injured, the damage to the disc itself is generally permanent. However, spontaneous recovery from nerve root pressure is common, because the displaced portions of the disc can "dry up" and get reabsorbed by the body over time. When this occurs, the pressure is relieved.

Spinal Cord Pressure and Paralysis

As we've seen, low back injuries can cause a variety of neurological symptoms when one or more nerve roots get compressed. However, it's rare for full-blown paralysis or other symptoms of spinal cord pressure to originate in the low back. Spinal cord lesions affect the lower body, but they rarely originate there. They are most commonly caused by injuries in the cervical area. For more detailed information on spinal cord pressure, please see the programs on cervical injuries.

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Other Injuries and Conditions

Osteophytic Root Pressure

- Major Indicators:
  - Increasing weakness, usually at one level
  - Usually over 50
  - Very stiff and limited motion
- Treatment:
  - Surgery to remove the osteophyte

As we age, small bony growths called osteophytes form throughout our spine. In some unfortunate cases, an osteophyte grows in the region of the intervertebral foramen and slowly begins to press on a nerve root. There is generally no pain, which differentiates this condition from a disc injury. The main complaint is gradually increasing weakness, usually at one nerve root level. This condition typically occurs in people who are over 50 years old. The only available treatment is surgery to remove the osteophyte.

Spondylolisthesis

- Major Indicators:
  - Spinal "shelf"
- Auxiliary Indicator:
  - Leg pain
  - Numbness or tingling in the legs and feet
  - Muscle weakness in the legs
- Treatment:
  - Surgery, proliferant injection therapy, limiting activities

Spondylolisthesis is a condition in which one or more of the vertebrae are substantially misaligned. A vertebra may be one-quarter to one-half inch out of alignment, anteriorly or posteriorly, instead of sitting squarely on the vertebra below. It will therefore be easier for the corresponding ligaments to get jarred and damaged. This also means that the disc is not as secure or well-protected as it should be.

The simplest way to detect spondylolisthesis is by slowly running your finger down the lower spine while the person is standing. You'll either come across a protruding bone that feels like a small shelf or you'll feel an indentation of the spine. In some cases, you can also feel the "shelf"

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while the client is lying prone. The abnormality will be most apparent on a standing lateral X-ray.

Some people experience no symptoms at all, while others have severe back and leg pain with nerve damage. Some people may experience intermittent back pain, particularly when hyperextending the low back. The joint instability associated with spondylolisthesis may cause a disc to rupture and press on a nerve root. This can cause symptoms including leg pain, electric-type symptoms with pain traveling down the leg, numbness or tingling in the legs and feet, and/or muscle weakness of the legs.

There are several different causes of spondylolisthesis that can be separated into two categories – congenital and acquired. Congenital anomalies, bone irregularities that you're born with, are a very common cause of spondylolisthesis. Acquired cases can occur as a result of aging, severe trauma, such as a serious accident, tumors in the spine, bone diseases causing degeneration of the bones of the spine, and/or certain surgical procedures. In some cases, aging causes degeneration of various tissues in the body, including the bones, joints, and ligaments that hold the vertebrae together. If these changes progress to a point where the ligaments and joints cannot hold the proper position of the spine, the result is what's known as degenerative spondylolisthesis, which most commonly occurs at the L4-L5 level. In contrast, isthmic spondylolisthesis occurs as a result of a spondylolysis, a small crack or fracture in one of the vertebrae — usually at the L5-S1 level. This type of fracture is most commonly the result of repetitive micro-trauma during childhood. Some sports are thought to make children more susceptible to developing a spondylolysis, including gymnastics, diving, and football. If the cracked vertebra slips forward over the vertebra below it, the result is isthmic spondylolysthesis.

Treatments for spondylolisthesis include surgery to stabilize the spine, proliferant injection therapy to stabilize the spine by tightening the ligaments, and/or limiting one's activities to avoid causing injury to the ligaments or discs.

Spinous Process Fracture (rare)

- Major Indicators:
  - Fracture visible on X-ray
  - Gap where a spinous process should be
  - Local pain
  - Local pain on resisted extension of the spine
  - Local pain on resisted side-flexion of the spine from a side-lying position
- Treatment:
  - Time and rest

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The most definitive test for a spinous process fracture is an x-ray. If a substantial portion of the process was broken off, you'll also be able to detect this with palpation. When you run your finger down the vertebrae, you'll hit a gap where the spinous process used to be. In addition, the client will experience pain on resisted extension of the spine and resisted side-flexion from a side-lying position.

Spinous process fractures are usually caused by a blow or a severe fall — often in a contact sport. You probably won't see one unless you work with serious contact sport athletes.

Transverse Process Fracture (rare)

- Major Indicators:
  - Local pain with deep breathing
  - Local pain on resisted side-flexion and resisted extension of the spine with the client lying prone
- Treatment:
  - Time, proliferant injection therapy

When a transverse process is fractured, the client experiences local pain while taking a deep breath, and also while performing resisted side-flexion and resisted extension of the spine from a prone position.

This condition typically heals on its own within a few weeks. If pain and discomfort continue, proliferant injection therapy is the best option.

As with the spinous process fractures, transverse fractures are usually caused by a blow or a severe fall — often in a contact sport. Both types of fractures are rare.

Ankylosing Spondylitis

- Major Indicators:
  - Increasing stiffness in early 20s
  - Morning back pain
  - Pain starts at sacrum and low back, and over time spreads up spine
  - Decreased ability for chest expansion
  - Pain and limitation in forward flexion and extension, and over time in side-flexion
  - Initially, feels better with exercise

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- Treatment:
  - Massage, exercise, proliferant injection therapy

Ankylosing spondylitis is a systemic arthritic disease that affects the spine and other joints. It usually begins in a person's early 20s, with increasing stiffness in the low back. The person feels pain most mornings and has difficulty getting out of bed. At first, the pain is felt in the low back and sacral area, but over several years it spreads up the spine to the thorax and neck as well. The person's neck, shoulders, and hip joints become inflexible and eventually worsen. Over time there is difficulty breathing as the arthritis sets into the costal cartilage joints of the ribs, and chest expansion becomes difficult.

On assessment testing, in the early stages, you'll see difficulty in forward flexion and extension. Later on, side-flexion becomes increasingly difficult as well. Sometimes, but not always, this condition can be identified through a blood test.

If the client exercises regularly, the disease progression may slow or stabilize for a while. Proliferants have also been found to be helpful in slowing the progression. However, there is no lasting cure for this condition. Eventually, exercise becomes less and less helpful.

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DVD #4 – Treatment Techniques

Principles of Friction Therapy to the Low Back

Friction therapy was developed by Dr. James Cyriax, a British physician who has since become known as the "father of orthopedic medicine." Frictioning addresses the problem of adhesive scar tissue formation in muscles, tendons, and ligaments, which is the cause of a great deal of chronic pain. In a healthy healing process, scar tissue serves as the biological glue that holds the torn fibers together in proper alignment. However, in many cases, this process goes awry.

Adhesive scar tissue often builds up indiscriminately, so the resulting tissue has much less integrity and uniformity of structure than the original tissue it replaces. This frequently occurs in the ligaments and some muscles of the low back and sacral area. Friction therapy breaks down poorly formed scar tissue and prevents its return. It also promotes the formation of properly aligned and mobile tissue, encouraging normal healing to occur.

Don't Over-treat

Always err on the side of caution, so you don't over-treat. It's very easy to over-treat someone when you're frictioning the spinal ligaments. Work very lightly during the first treatment to see how the person responds, then use that information to guide your future treatments, where you may be able to use more pressure.

Be sure to tell your client that the area you treated might be a little sore for a day or two, but the discomfort shouldn't last more than 48 hours. At the second appointment, find out how the client felt after the initial treatment. If the post-treatment soreness lasted longer than 48 hours, or if the client simply can't tolerate the soreness, cut back on the pressure and/or the duration of the treatment.

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Guidelines for Frictioning the Lumbar Spine

Of course, learning any hands-on techniques takes personal instruction. These techniques are demonstrated here for your information, but generally cannot be mastered unless there is private instruction in addition to the DVD programs.

- Use no lubricants
- Keep your friction strokes perpendicular to the fibers of the injured tissue
- Apply pressure in one direction only
- Alternate the direction of pressure as often as needed for your own comfort
- Work on one side at a time
- Use varied finger positions
- Keep your fingernails very short
- Alternate hands often
- Move your whole hand
- Make sure the skin moves with you
- Press the structure against the bone
- Be sure the client is comfortable

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Friction Treatment Protocol

Frequency

When clients are receiving friction therapy in the lumbar and sacral regions, it's best if they come twice a week. Consistent treatment aids the healing process. As recovery proceeds, you can lessen the frequency of your sessions.

Duration

With this treatment, a recent injury takes about 4–6 weeks to heal, and a long-standing injury takes about 8–12 weeks.

The actual healing time will vary depending on several factors:

1) How long the injury has been present

2) Whether the person is repeatedly re-injuring the low back

3) The client's general health

Ideally, you'd begin treatment 48 to 72 hours after a traumatic injury. In most cases, you'll be doing friction for 5 to 10 minutes at first, and eventually increasing to 20 or 30 minutes per session if there are multiple injuries.

Pacing

In a person experiencing low back pain, it's common to find that 6 to 8 ligaments and muscles are injured simultaneously. After you've frictioned a structure for a few minutes, move on to the next one. The low back is often too sensitive to tolerate very much work on one segment. As you progress, slowly work more deeply on the injured structures.

It's important to avoid over-treating with friction therapy - particularly when you're working in the low back region. Some clients can tolerate only very light pressure at first, and you may have to work for a long time using barely any force. Educate your clients so they can help guide your work. Before you begin, explain that the process of breaking up scar tissue is somewhat uncomfortable, but should not cause significant pain. The discomfort should be no more than annoying.

Check in frequently with the client to be sure you're using the optimal amount of pressure - especially if you suspect the person may be reluctant to tell you to "lighten up." If the client feels more than a slight discomfort or a mildly annoying sensation, you need to proceed more gently.

While you're working, also be alert for any nonverbal cues of discomfort. Observe your client's face, body movement, and breathing during the frictioning. If the client says everything is fine,

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but constantly moves away during the treatment, decrease your pressure. Also be aware of your own level of comfort. Because this work is so precise and repetitive, you may find yourself getting tired and sore. Build up your hand stamina by frictioning for short periods at first, and by exercising your hands and fingers.

Post-friction Guidelines

After you've completed a session of friction therapy, fully massage the low back, sacrum, and buttock areas. This helps to enhance circulation in the tissues you just treated. At the end of the appointment, remember to mention that the affected area may be sore for up to 48 hours. Check in at the beginning of the next appointment to find out how the client felt after the treatment. If soreness lasted for more than two days, or if the client simply can't tolerate the soreness, cut back on the pressure and duration of the friction part of your treatment.

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Friction of the Low Back and Sacrum

The Parts of the Hand

- The Fingertip: You can't use it if you have fingernails that cut into the skin. When the fingertip is used it gives intense pressure.
- The Fingerpad: Applies less pressure.
- The Wrist Point: The medial hard part of the heel of your hand where the pisiform bone juts out.
- The Thumb Point: The distal thumb joint on the palmer side of the thumb.
- The Thumbpoint Position: Places the pisiform bone of the top hand onto the back of the thumbpoint of the bottom hand to create very intense pressure with very little effort when you lean into it.

Techniques for Working with Specific Structures

Frictioning the pelvic ligaments is a little different, because there's such a large and complex web of fibers surrounding the sacrum. Sometimes you'll be performing the strokes in a diagonal direction so that you're at a ninety-degree angle to the injured ligament.

Friction Therapy Techniques

Supraspinous Ligament Friction

Stand or sit at waist level with the client lying in a prone position. When frictioning the supraspinous ligament use your thumb, index, or middle finger - whichever is easiest for you. Place your finger in between any two vertebrae on the central portion of the supraspinous ligament in the low back. First pull the skin toward you, press down, and friction all the way across the vertebrae moving your hand away from you. Release your pressure and move back to the starting position bringing the skin with you. Do that repeatedly. Then starting again in the center, move the skin away from you, apply an anterior pressure, and sweep across the entire ligament toward you. Release your pressure and move back to the starting position, bringing the skin with you. Do this repeatedly, applying pressure in one direction only.

As part of your assessment you will palpate each supraspinous ligament by briefly frictioning it at each level with one or two cross-fiber strokes to find the areas of tenderness. The injured areas may be in the central portion of the ligament or on the left or right edges. The most common sites of injury are at L4-L5 and at L5-S1. If the injury is on the lateral edge, place your finger in the groove between the lateral edge of the spine and the erector spinae muscle. Press anteriorly and medially, and sweep across the lateral edge only. To work the other side, place your finger in the groove on the opposite side and move medially, working primarily the lateral

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edge of the ligament on the other side. Repeat this same motion at each level where there is tenderness or pain. Friction the various sites of tenderness for a total of five to ten minutes, moving between the various tender ligaments, and taking breaks as needed. Remember to perform these friction strokes in an east-to-west or west-to-east direction, so that you're moving at a ninety-degree angle to the direction of the fibers.

Suprasacral Ligament Friction

The suprasacral ligaments can be frictioned in the same manner as the supraspinous ligaments. They are somewhat easier to work on, since they are thinner and shallower. Place your middle or index finger just below the L5 spinous process. Now move inferiorly to the space just below the S1 bony protrusion on the sacrum and begin to friction in the space between those bony landmarks. Use your thumb, middle finger, or index finger as you slowly move down the central line of the sacrum, frictioning each section of the suprasacral ligament. If these structures are injured, they will be quite tender to the touch with very little pressure. Remember to move across the ligament fibers in one direction at a time. The suprasacral ligaments run down the median sacral crest, attaching to the tubercles on the sacrum. The tubercles are the remnants of the spinous processes that remain after the fusion of the sacral bones. These ligaments form a direct continuation of the supraspinous ligaments. Be sure to palpate them as part of the final stage of your assessment procedure.

Intertransverse Ligament Friction

Stand at waist level with the client lying in a prone position. Use the tip of your thumb to apply pressure to the lateral aspect of the intertransverse ligament. L3-L4 is often the easiest point of access. Friction in an anterior to posterior direction, moving your thumb tip slowly through the ligament. Use a rocking motion to help relax the client while you are working. Repeat at any other levels where the ligament is injured.

Iliolumbar Ligament Friction

This ligament is located on the anterior-superior surface of the ilium - approximately an inch lateral and superior to the PSIS. When you move laterally on the ilium to locate the ligament, remember that a female pelvis is wider and flatter and a male pelvis is narrower and more vertical. The iliolumbar ligament is located just inside the superior edge of the iliac crest. Friction is performed at the attachment along the rim of the ilium. The most efficient position for frictioning the iliolumbar ligament is to stand at the level of the clients shoulders. Stand on the same side as the area of the low back you're going to be working on. Lean over the client's upper body and place both of your thumbs on the crest of the ilium, approximately one inch lateral and superior to the PSIS. Now, with your thumbs facing each other, simultaneously press inferiorly onto the upper lip of the ilium and anteriorly toward the floor, as you move laterally. Then release the pressure, move back to the starting position, and repeat. Alternatively, you can try standing at the client's hips using your index and middle finger to perform the friction stroke. Use whichever position is most comfortable for you.

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Sacroiliac Ligament Friction

The sacroiliac ligaments are easily palpable just medial to the lip of the ilium, near where the PSIS overhangs the sacrum. Use your middle, index, and ring fingers together, or your thumb, to apply pressure across the ligaments in one direction at a time. Place your fingertips over the edge of the ilium just above and below the PSIS on the sacroiliac fibers. Press anteriorly and move in a diagonal, outlining the edge of the sacrum. You can also use your thumb, which is easier when working on the opposite side in a similar manner. Work diagonally across the sacrum in the groove between the lateral edge of the sacrum and the central extension of the spine, moving to different sections depending on where you find the tender areas. This is the most commonly injured area in the low back, causing a diffuse pain straight across the low back which often refers pain into the buttock and down the legs.

Friction of the Coccygeal Ligaments

To friction the superficial dorsal sacrococcygeal ligament, place the tip of your index finger at the center of the lower sacrum, just above the superior aspect of the coccyx. Slowly slide your finger inferiorly until you reach the inferior tip of the coccyx. The superficial dorsal sacrococcygeal ligament covers approximately the last inch of the posterior coccyx. The fibers are vertical, so you will perform your friction strokes horizontally over the ligaments. Perform the friction strokes with your index and middle fingers.

To friction the lateral sacrococcygeal ligament, begin by placing the tip of your index finger at the center of the lower sacrum, just above the superior aspect of the coccyx. Slowly slide your finger down to the inferior tip of the coccyx, then move laterally about a half-inch to the lateral edge of the coccyx. Now friction the lateral sacrococcygeal ligament with one finger by moving your finger in a diagonal direction through the fibers of the ligament. If there is pain on the other side as well, move to that side and repeat the friction there. If the fibers of the gluteus maximus are injured at the attachment to the lateral coccyx, move your finger slightly more laterally to friction against the lateral edge of the coccyx in this way.

Gluteus Medius Friction

Standing at the side of the table, make a fist and place your hand in the thumb supported position, putting your thumb at the middle of the gluteus medius muscle, about two inches inferior to the iliac crest. Be sure your thumbpad is facing down toward the floor. Now take the skin up about an inch so you are at the medial edge of the gluteus medius. Lean into your thumb and slowly move down (anteriorly) toward the table, frictioning the gluteus medius muscle. Move to different areas that are tight and tender. Alternatively, you can reach across the table and begin the friction stroke by moving the skin to the lateral anterior edge of the gluteus medius. In this case, you're using the tips of your fingers with your other hand supporting them to apply the pressure. Pull upward (posteriorly) toward yourself.

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Sacrotuberous Ligament Friction

To friction the sacrotuberous ligament, place your thumb tip or fingertips along the margin of the sacrum, just below the PSIS. Friction against the edge of the sacrum, moving gradually down to the superior edge of the coccyx. Move slowly in this often-sensitive area, spending a minute or two on each segment of the ligament. Lesions are most common along the margin of the sacrum and at the lower portion where the ligament breaks away inferiorly from the sacrum. In cases where there is severe pain or the client is uncomfortable lying prone, it may be more effective to perform the friction with the client in a side-lying position with the knees up. In this position, the ligament becomes somewhat taut and easier to access in some clients. Also, there are some individuals who are more comfortable lying in this position than lying prone. Use your thumb tip or fingertips to friction one section of the ligament at a time, moving slowly from one segment to the next.

Psoas Technique

With the client supine, measure the person's leg length by pulling down on the heels and placing the medial malleoli together, with your thumb at the base of each malleolus. If one leg is shorter, work on the short side. This usually means that the psoas muscle is chronically tight on that side. Performing this therapy on the psoas muscle can help to even out the leg length.

Stand at waist level and place your footward hand on the client's thigh, just above the knee. Once the other hand is in position, you will be rocking the thigh by gently pushing medially and letting go like this. Practice this rocking action with me for a moment. This allows you to move the psoas from its attachment to the medial thigh below, instead of moving the hand directly over the psoas attachment to the spine; which would create much more discomfort for the client. With your other hand, make a loose fist and place the heel of your hand on the anterior superior iliac spine. This will help guide you to the psoas attachment. Then place your proximal interphalangeal joints (also called PIP joints) in line with the lateral edge of the spine, where the psoas attachments are located. This is lateral to the bulge of the rectus abdominus muscle. The middle of your hand should be approximately at the level of the navel. Sink down slowly until the client feels a small amount of discomfort, and hold that position.

Now, with your footward hand, begin to rock the thigh medially, and allow it to swing out laterally by itself. At the same time, use your headward hand to maintain a constant pressure on the psoas attachment to the spine. As you do this, gradually change the pressure from the center of your fist to your index and middle finger knuckles and then toward the fourth and fifth knuckles, rolling slowly to different parts of the psoas. You can also move your entire headward hand up and down as needed.

For an individual who is sensitive in the psoas area, you can begin more gently with these two modifications. Start by using the heel of your hand to apply pressure on the psoas attachment, this is much less intense and warms up the area; then, after a few minutes, try switching to the knuckles. Remember there should only be mild discomfort. This tells you that you are using the correct amount of pressure.

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In addition, you can perform this technique with the knee bent. It relaxes the more superficial abdominal muscles so that moving through the muscles and the abdominal contents is less difficult for the client. You can perform the technique with greater depth by using your fingertips instead of your knuckles. In this case, to change the focus of pressure, just move your hand slightly up or down along the psoas attachment as you continue to move the psoas by rocking the thigh. Don't roll through your fingertips. This technique is more intense than the others, so keep an eye on the client's face to make sure that you are not applying too much pressure. Sometimes they grimace, but don't tell you it's too much pressure. It often takes two or three treatments using this psoas technique to get the full correction.

After you've done this for a minute or two, go back to the feet and firmly grasp the foot on the side you've been working on. Then shake the leg on that side and apply some traction and compression in this way several times. Now pull on the heels as you did when you started, to re-measure the legs to see if the legs are more even. Repeat the entire technique up to three times to see if you can get the legs to be the same length.

Iliacus Release Technique

In the same position as the Psoas Technique, with your footward hand on the client's thigh, wrap the fingers of your headward hand around the anterior superior iliac spine onto the iliac fossa. Now compress the iliacus muscle against the bone. While maintaining the pressure on the iliacus with your fingers rock the leg. Move your fingers slightly up and down along the iliacus as you work. This is an uncomfortable position for most clients, so go gently moving slightly superior and slightly inferior.

Gluteus Medius Release Technique

With the client prone, bend one knee using your footward hand to hold the ankle, so the lower leg is at a 90 degree angle. Place the thumb of your other hand on the gluteus medius muscle, and apply a steady pressure. Your fingertips should be resting near the edge of the sacrum, to stabilize your hand. Now, gently move the lower leg - you can swing it back and forth across the body or create a circular motion in either direction. This relaxes the gluteus medius muscle without much discomfort. Keep changing your thumb position on the gluteus medius, and keep varying the motion to make sure the client is not helping you move the leg. Do this for two to three minutes.

Piriformis Release Technique

With the leg in the same position, move your thumb posteriorly into the greater sciatic notch and apply a steady pressure along the piriformis muscle. Swing the leg as you did for the Gluteus Medius Release Technique, this time helping to release the piriformis muscle. Keep checking to make sure the person is letting go of their leg and giving you their weight. Continue this for two to three minutes.

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The best way to master this material is to have a private tutorial with one of my teachers after learning the hands on techniques. If you live in or near Albuquerque (NM), Boston (MA), Chicago (IL), Olympia (WA), Salt Lake City (UT), Seattle (WA), Washington, DC, or Barcelona, Spain, contact one of my instructors through my office and take a private tutorial.

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Myofascial Therapy

All of the ligaments of the low back and sacrum are encased in a fascial covering. Sometimes the fascia itself becomes injured and adhesive scar tissue develops there, as well as in the ligaments.

Both myofascial and friction therapy are done without any lubricant. If the client's skin is extremely dry, you can use some moisturizing cream for the myofascial therapy. First determine whether any portions of the fascia are injured. Perform a few myofascial strokes - starting out gently, and then going in deeper. If the motions are uncomfortable or painful, there is work to be done on the fascia. If there are fascial restrictions contributing to the person's low back problem, this work will be slightly uncomfortable at various places along the way.

Myofascial Technique

Supraspinous Fascial Separation

This technique separates the fascial adhesions in the supraspinous ligaments between the S1 and L1 vertebrae. Place the pad of your right thumb or middle finger just below L5 on the supraspinous ligament. Sink into the tissue and move very slowly up the fascia, as the tissue allows. Meanwhile, use your left palm or fingers to stretch the skin down. We refer to this method of stretching the skin with one hand and working with the other as "skin tracking." By using skin tracking, you are avoiding unnecessary discomfort by preventing the skin from bunching up in front of your working finger or thumb. First work the central portion of the ligament, both vertically up and then down. Work up slowly, sensing the tissue as well as asking the person if they are feeling any discomfort. If there is discomfort, stick with it for a while. If not, move on to working in the opposite direction, then work horizontally.

When you work horizontally, pull the skin toward you as you move away, crossing the supraspinous ligament at a ninety degree angle. Do this at each level where there is discomfort. Be sure to position your body so you do not strain yourself. Finally work the lateral edges of the supraspinous ligament. This is a common area of injury. Use the skin tracking if needed for the person you are working with.

Ilio-Fascial Separation

This technique works on the fascial adhesions along the crest of the ilium. Begin at the medial portion of the ilium and work laterally with a very slow, consistent motion. To treat the far side, try placing your hand in the supported thumb (or thumbpoint) position, leaning your weight over your hand and slowly moving outward to separate the fascia. The pressure is anterior and inferior, down toward the floor and the feet at the same time. You can also work the far side with your middle finger, or the flat part of your index finger knuckle (between the two joints) if that's more comfortable for you. Find the position that works best for you and your body.

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To work the near side, place your hand in a bridge position, bearing all the weight on the pad of your thumb. Now, use the weight of your body to apply pressure, and move slowly along the superior edge of the iliac crest. You can also use your finger tips on the near side.

Iliolumbar Fascial Separation

This technique works directly on the fascial adhesions of the iliolumbar ligament, in four directions. Position yourself at the head of the table and use your fingers, thumb pad, or the flat part of your index knuckle to move laterally along the short section of the iliac crest where the fascia, covering the iliolumbar ligament is located. Now move over the crest medially in the opposite direction. Then, still standing at the head of the table, stretch the fascia downward inferiorly toward the client's feet. Begin about an inch above the crest of the ilium, just superior to the iliolumbar ligament, and move inferiorly onto the buttock. Then move to the side of the table to stretch the fascia upward. Begin below the iliac crest on the gluteus muscle, and focus your intention on moving through the pelvis, pressing anteriorly toward the floor.

Sacroiliac Fascial Separation

With one hand, pull the skin covering the sacrum in a footward direction and slightly laterally. Now, using your thumb or fingers, work in a superior direction, at a right angle to the sacroiliac ligament fibers. Use the same skin tracking technique to separate the sacroiliac fascia in the opposite direction, moving inferiorly. On some individuals you do not need to skin track and can use the fingertips of both hands simultaneously. This is often the preferred method. Move your hands to the opposite side of the sacrum and use your thumb or fingertips to perform this technique across the body.

Sacrotuberous Fascial Separation

This technique can be performed with a client lying prone, but is often more effective with a person in the child's pose or a side-lying position. Beginning in the prone position and using the pad of your thumb, or the tips of your fingers, slowly move from the PSIS along the sacrotuberous ligament to the coccyx. Then reverse the direction. When the client is in a side-lying position, place the head on a pillow, the knees pulled up, and a towel under the waist if needed for comfort. Again, you'll be working at the lateral border of the sacrum, beginning just inferior to the PSIS and moving all the way down to the superior edge of the coccyx. You may do this technique with your thumb, side flat knuckle or, for a broader gentler stroke, with your elbow. When you're moving horizontally, you need to use skin tracking. The client can be in child's pose, with the knees bent, the head on the table, a pillow under the chest, and the arms at the sides. This position gives you the best mechanical advantage when performing this technique.

Lumbosacral Fascial Separation

This technique may be done with the client lying prone or in child's pose with a pillow under the abdomen if needed. The lumbosacral fascia covers the entire sacral area. Use your middle three fingers to perform an outward fanning motion three or four times, each moving slightly more

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laterally. Now do the motion in reverse, with skin tracking. Then move vertically over the fascia with your thumbs or flat side knuckle.

Gluteus Medius Fascial Separation

Stand next to the hip you're going to work on. Place your elbow just inferior to the PSIS near the lip of the iliac crest, and face slightly away from the table, with the leg closest to the table lunged forward. Now lean into your elbow and slowly perform three or four half moon separations through the gluteus medius fascia. As an alternative, you can stand facing the hip and take the thumb-bridge position with your headward hand. Place your thumb pad medially just inferior to the PSIS near the iliac crest and perform the same half moon motions through the fascia.

Quadratus Lumborum Fascial Separation (Side Lying)

This technique separates the fascia of the quadratus lumborum muscle, particularly at the lateral edge. It is performed with the client in a side-lying position with the top leg straight, the bottom leg bent, and a towel supporting the side of the abdomen. Using your fingertips, elbow, thumb pad, or supported thumb-point position, begin the movement at the crest of the ilium and work slowly up the edge of the quadratus muscle. Apply pressure downward toward the floor and superiorly toward the head. When you reach the top of the attachment to the transverse processes, work along the bottom of the last rib. Then reverse directions.

Erector Fascial Separation

This technique separates the fascial adhesions within the erector spinae muscles. With the client either prone or in child's pose, stand at the side of the table below the level of the hips. Begin the movement at the base of the low back, just superior to the iliac crest. Place either your elbow or one thumb at the base of the middle section of the erector spinae muscles, and move slowly up the lumbar region skin, tracking with the other hand as needed. Work along the myofascial fibers of the paraspinal muscles. Now repeat this technique, moving your focus first slightly medially and then slightly laterally. Then change directions, beginning at about T12, and perform a similar movement in the footward direction. When working in this direction, it is generally easier to use your elbow or just one thumb. Once you've done these movements on one side of the spine, repeat on the other side. Finally, use your finger tips and pads to move horizontally over the fibers, jumping gently over the spine. In the child's pose you get much better leverage when working on the erector spinae muscles.

Ilio-tibial Band Fascial Separation (lower part) (side lying)

Have the client in a side-lying position, with the bottom leg straight and the top leg bent. Place one pillow under the head and another under the bent knee. You can perform this technique using the heel of your footward hand, the side of your forearm leaning into your ulna, or your four knuckles. The forearm or knuckles will sink in most deeply. Lean forward and apply pressure at the greater trochanter, then move slowly from there toward the knee. Keep your

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headward hand resting on the client's waist. Then go around to the other side of the table and perform the movement in the opposite direction, from the knee to the greater trochanter. While working in this direction, it's best to support the bent leg at the lateral ankle so that the leg stays stable.

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Massage Therapy

Hand Positions and Definitions

- The Basic Position
- 1-2 Rhythm
- Double Rhythm

Massage Techniques

Low Back Square

Place your hands on either side of the spine, with the heels of your hands on the iliac crest and your fingers pointing toward the head. With equal weight in each hand, begin moving up the back. When the heels of your hands get to the base of the ribs, move laterally to the sides of the body, outlining the base of the ribs. Follow the inferior angle of the ribs as they move laterally. Release the pressure and drag back with your hands about an inch off the table, making the shape of a square on both sides of the low back. Be sure to do the complete drag-back inferiorly, moving along the sides of the body all the way to the hips, then move medially to the starting position. During this movement, move at a slow to moderate pace, keeping your hands parallel and your fingers just slightly apart. Keep your elbows bent and lean your weight into the low back by bending and straightening your front knee. The weight is in the palms and heels of your hands. Try not to push - just use your body weight. By keeping your elbows bent, you don't place too much stress on your wrists. Imagine you are scooping out the low back beginning as soon as the heels of your hands come over the iliac crests. Keep that steady pressure all the way up to the top of the low back and as you move laterally along the base of the ribs. Lighten up as you come to the lateral edges of the body before you gently but firmly drag back. The drag back has firm contact but no real pressure. This gives you and the client a momentary rest before the next movement.

1-2 Low Back

1-2 Low Back has a rhythmic component that surprises and tricks the body into letting go of tension. Stand on the left side of the table and begin the movement with the left hand. Rest the heels of the hands just inferior to the iliac crests. Move the heel of the left hand toward the base of the ribcage, along the erectors and quadratus-lumborum muscles. The right hand follows in an identical movement pattern one-half beat later, while the left hand slows down and waits for the right hand to catch up. As the movement progresses, the hands turn in slightly, at about a 5 degree angle. At the top of the movement, when you reach the base of the ribcage, move the hands away from the spine, still using pressure, laterally across the erectors and the base of the ribs. Release the pressure before moving over the bony more exposed part of the ribs. Drag your hands inferiorly down along the sides of the body to the hips and then medially to the starting position. Keep the alternating 1-2 rhythm each time you repeat the technique. Both

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hands should exert equal force. Think of scooping out the back or digging a hole with your hands as the heel of your hands move just above the crests of the ilium. Be sure to use your front knee as the source of power, and keep your elbows bent to protect your wrists. This movement can be done at varying speeds from very slow, which promotes relaxation, to rather quickly, to energize the person.

Hook

With the client in a prone position, place your footward hand in a C-shape right above the iliac crest by placing your finger pads on one side of the spine and your thumb pad on the opposite side. Your palm should not touch the back. If your hand can do so comfortably, attempt to grasp the lateral edges of the erector muscles. While maintaining this position, move your hand up the back using a firm pressure until you get to the base of the ribs. At this point, drag-back lightly by reversing direction. This movement uses a double rhythm so that the drag-back will take half the amount of time as the movement, like this, so it is a bit relentless. Remember to apply pressure from the very beginning of the movement, not build to it while you're in the middle of the stroke.

Reverse Hook

Place your headward hand in the C-shape at the top of the low back right below the base of the ribs. Move your hand down the back until you get to the iliac crest. At this point, drag-back lightly by reversing your direction. As with the Hook, this movement is a double rhythm so your drag-back will take half the amount of time as the movement. Remember to apply pressure at the very beginning of the movement.

Opposition Hook

The footward hand is placed above the iliac crest in a C-Shape (as in the 'Hook'). As this hand moves up the back to the base of the ribs, it then lifts off and is replaced by the headward hand. The headward hand begins at the base of the ribs (as in the 'Reverse Hook'), and moves down the back, stopping above the iliac crest where it lifts off and is replaced by the footward hand. The hands switch off, moving up and down the low back in an even rhythm.

Stretch

To work the far side of the lumbar region, stand at the client's low back and place the headward hand over the footward hand. The heels and palms of both hands are placed on the erectors in the lumbar region, fingers pointing away from you. Lean into your hands and push them away from each other. The lower hand moves diagonally onto the hip and the upper hand moves directly up toward the head with the heel right next to the spine, each hand moving approximately three inches in both directions. Release the pressure and let the hands drag back to the start. As you work the far side part of the movement, you will need to bring your chest over the client's body, like this. To work the near side, shift your position so you are standing at the client's hip, facing the head. The footward hand crosses over the headward hand, and is placed so that the fingers are pointing headward, the little finger next to the spine and the heel in

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the mid lumbar region. The headward hand is perpendicular and just inferior to the footward hand. Lean into your hands and push them away from each other, stretching the low back. The lower hand moves diagonally onto the hip; the heel of the upper hand moves superiorly up the erector spinae to the base of the ribs. Release the pressure and let the hands drag back to the starting position. As you do the movement, be sure not to let the heel of the hand go above the low back and onto the exposed bony parts of the rib cage. Don't press into the spine. Bend well at your hips and knees, allowing your body to rock up and down providing the pressure as you perform the stretch movement.

Heel Half Moon

The erector spinae muscles widen as they move from the thorax to the low back progressing from an inch to approximately two inches wide. Stand at the client's shoulder and place your hands on top of one another in the basic position, with the headward hand on the bottom, its fingers facing diagonally away from you toward the opposite hip. Start just inferior to the scapula. The pisiform bone of the headward hand should be against the outer edge of the erector spinae muscles. Lean into the pisiform bone, stroking down the edge of the erector, and following it as it widens. When you reach the lower thoracic region at the very base of the ribs, circle out laterally, lightening your pressure before pressing into any of the lower ribs. Relax your hands and drag back superiorly along the lateral border of the body to the starting position. You can lean over to work on the far side of the body without walking to the other side of the table. Press anteriorly and diagonally toward yourself as you move down the lateral edge of the erector, widening as you go. Lighten up as you reach the base of the ribs and drag back to the starting position.

Thumb Point Half Moon

Perform the same movement as Heel Half Moon, only this time use the thumbpoint position as the focus of pressure instead of the pisiform bone. This focuses the pressure in a much smaller area and goes much deeper. It is performed after the Heel Half Moon if the person has let go sufficiently as to warrant more pressure. Remember to lean into the thumb point working along the edge of the erector, moving laterally as it widens. When you reach the lower thoracic region, circle out laterally and lighten your pressure, as before. Relax your hands as you drag back along the lateral border of the body to the starting position. You can also lean over to work on the far side of the body without walking to the other side of the table, if you wish to. Press anteriorly and diagonally toward yourself, on this side, as you move down.

Thumb Point Erector

Using the thumb point position with the pisiform bone over the distal joint of the thumb, work the erector spinae muscles in the lumbar region, making vertical lines along the length of the erector spinae. Begin gently in the center of the muscle, then work your way medially and laterally. Do the movement slowly at first and then, if the back lets go, move at a slightly faster speed, executing several movements in quick succession. Or use a double rhythm. This is a very deep movement. Pay close attention to the client's breathing and body response to gauge their comfort level.

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Zig Zag

For this movement, use the thumb point position, and start at the base of the ribs. Push away from you diagonally across the muscle, and then reverse direction pulling diagonally towards you, making a narrow "z" shape over the erector muscles while moving inferiorly toward the feet. You can apply pressure in one direction (for instance, primarily away from you), or in both directions, but always accenting the thrust away from you. Perform the movement on one side several times and then switch sides to work on the same level. Then move down a level and repeat. You can do this movement in 3's (meaning 1 stroke away, 1 stroke toward and 1 stroke away from you for a total of 3 strokes), 5's, or 7's along the erectors in the low back region. Deepen the pressure only as the person relaxes. Do not do the movement with your thumb. Rather, move the whole hand as one unit, leaning the weight of your body on the distal thumb joint. Always press away from yourself and lean your body weight into both hands. Let your bottom hand stay relaxed. Drag back to the starting position with contact but no pressure. This is a very intense movement that helps to reduce the level of tension in the back. You may feel the muscle jump or resist you. If you do, work lighter, sensing what the right pressure for this person is based off of their body's reaction.

Hip Circle

Standing at the level of the client's upper thigh, place your hands in the basic position with your right palm on the fleshy part of the client's hip, fingers facing superiorly. The fingers are relaxed and draped over the iliac crest. The pressure is anterior toward the table and diagonally in toward the sacrum, with the focus of pressure on the palm and heel of your hand. Gently lean into your hands, moving the heel of your hand superiorly toward the client's iliac crest, and circling out laterally. Release pressure as you continue to circle around to the starting position. Work only the hip closest to you. Move to the other side of the table to work on the other hip. Move at an even, slow speed in this beginning movement using a moderate amount of pressure. Depending on the client's anatomy and the angle of the client's hips, you will have to angle your body to make this movement feel comfortable for you to perform - you may need to move yourself further from the table. Be sure to keep your hands with fingers pointed toward the head. Use your weight by bending your forward knee to create the pressure – try not to push with your arms.

Sacrum Oval

Sacrum Oval has a calming and energetic effect. Begin in the basic position with the heel of the footward hand flat on the inferior part of the sacrum. Keep the fingers of the footward hand relaxed, allowing them to spread slightly. Slowly move the hand clockwise in an oval shape over the sacrum. Lean with very slight pressure on the upper half of the oval, and relax on the second half. The pressure and focus is in the center of the palm of the hand. After 4-5 repetitions, reverse and repeat the movement in a counter-clockwise direction. Always perform this movement in an even slow tempo. If you make the oval too small, the hair over the sacrum may become tangled and slightly painful. If this occurs, make your oval bigger.

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Opposition Thumbs

Place your fingers on the side of the buttock, facing diagonally toward the sacrum to stabilize your hands. Using your thumb pads, move them in opposition, like a windshield wiper, staying between the greater trochanter and the lateral crest of the ilium. As you perform this movement, you will be moving medially and laterally, covering all the gluteal muscles. This is a continuous movement - one thumb moves towards the other, alternating right and left. The thumbs lift slightly off the body, and there is no drag back with contact. The hands stay still, while the thumbs do all the work. Move moderately quickly, using a medium to deep pressure.

Sacral Border

Standing at the side of the hip you are working on, place your thumb pads or tips on the edge of the sacral border and brace your fingers on the opposite hip. The thumbs move in opposition as though you are trying to scoop under the lateral edge of the sacrum, or the sacral border. Work in small segments along the length of the sacral border. Use moderate pressure and move evenly. Be careful where your fingers are bracing. Don't let them drift.

Sacrum Twist

In this movement, you are making two tear-drop shaped movements with the pisiform bone on the sacrum as you move it around the PSIS. Start with your hands in the basic position, with the heel of your lower hand centered on the lower sacrum. Slowly move superiorly as you gradually twist your hand away from you, pointing your fingers diagonally across the body. Your pisiform bone should glide in the groove between the suprasacral ligament and the lateral edge of the sacrum, moving around the PSIS. Continue the movement superiorly and then laterally around the PSIS. Continue inferiorly around the sacral border and onto the posterior sacrum back to the starting position. Be careful not to jam into the PSIS or the spine. Allow the position of your hand to adapt as necessary as you return to the starting position. The drag back occurs as you return to the starting position on the posterior sacrum. Repeat on the opposite side of the sacrum and ilium. Once you get the hang of it, alternate sides; work first one side, then the other. Both times, as you begin the movement, the fingers of your bottom hand twist away from your body. Your focus of pressure remains on your wrist point or pisiform bone, which is gliding in a depression between the central line of the sacrum and the lateral edge of the sacrum. You are working the sacro-iliac ligaments. Your palm remains down and in contact with the sacrum and low back at all times. Use a moderate pressure while moving slowly and evenly.

Double Hip Circles

Standing at the client's thigh, place one hand on the fleshy, center of each hip. Your hands should be parallel, fingers pointed toward the head. Begin by moving the hands superiorly toward the iliac crest, then laterally, staying inferior to the iliac crest. Focus your pressure on the thenar pads and palms as you move up and out. Let your body lean slightly over the client. Drag back in an oblong shape to return using firm contact, but no pressure. Move slowly and evenly and use a moderate pressure.

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Exercises For the Low Back

The exercises prevent the re-formation of adhesive scar tissue that's been eliminated through the treatment, and they help the treated tissues heal in the presence of movement. These exercises should not cause any pain or discomfort. If they do, the client is not ready for them yet. In that case, have the person try doing the auxiliary exercises.

Sitting Forward Bends

Sit at the edge of a chair with your legs approximately two and a half feet apart. Clasp your hands together with your arms extended in front of you and slowly bend forward, relaxing your neck so that your head hangs down. As you bend forward, your hands will make an arc and go under the chair, placing a gentle stretch on the ligaments of the low back. The movement should be continuous: once you've gone as far as you can with no pain, don't stop moving - gently come back up to the starting position. Repeat this movement 40–50 times, two or three times a day.

Standing Forward Bends

Once you're comfortable doing the sitting forward bends, add this variation.

Stand with your feet a few inches apart. Slowly bend forward, moving your hands in the direction of your toes while keeping your knees straight. Do not force the movement or strain to touch your toes; keep it relaxed and easy. The motion should be continuous. At the end of the movement, don't stop - slowly come back up to the standing position. As you practice forward bending over time, you will gradually reach farther down. Repeat this movement 40 to 50 times, two or three times a day.

Leg Up Forward Bends

This exercise is particularly useful in cases of iliolumbar ligament sprain. Stand next to a chair or step and place your foot on it so that your thigh is at a 90 degree angle (or more) to the trunk of your body. Be sure your feet are facing forward and are relatively parallel to one another. Now slowly bend forward toward your standing foot, so that your hands move toward the ground on either side of that foot. Your body will rotate slightly toward the standing foot. Having the right leg raised places greater tension on the right side of your low back and sacrum, and having the left leg raised places greater tension on the left side. After you finish one side, repeat the exercise on the other side. Repeat this movement 25–50 times, two or three times a day.

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Auxiliary Low Back Exercises

The exercises in this section gradually increase low back mobility and strength. All of these should be done within a pain-free range of motion. Do 8–10 repetitions of each exercise.

Exercises to be Done on All Fours

Begin these exercises on your hands and knees with your back relatively straight, shoulders neither hunched nor retracted, and hands directly under your shoulders.

The Cat

Imagine that your spine is like a piece of elastic, and arch your back up toward the ceiling. Return to the neutral position - spine parallel to the floor - and then reverse the curve, arching your spine toward the floor. Keep the motion rhythmic and continuous. After each motion, return to neutral and then begin again.

The Dog

Move your hips from side to side like a dog wagging its tail. Think of moving your right hip toward your right ear, and vice versa.

Weight Shift

Shift your weight so that most of it is on your right hand and right knee, still keeping contact on the floor with your left hand and left knee. Then, shift your weight toward the left. This is a preparation for the next exercise.

Leg Extension

Extend your right leg behind you so the foot and knee come off the floor and the knee straightens. Lift the leg until it is in line with your hip and parallel to the floor. Return to the neutral position and repeat with the left leg.

Arm Extension

Extend your right arm in front of you until it comes to shoulder height. Return to the neutral position and repeat with the left arm.

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Arm/Leg Extension

Combining the two previous exercises, extend your right leg behind you and your left arm in front of you, both at the same time. Return to the neutral position. Then repeat with the opposite arm and leg.

Exercise to be Done Prone

Leg Extension

While lying face down on the floor, slowly raise your leg and then replace it on the ground. Then repeat with your other leg. For a variation, raise the thigh and scissor it over toward the other leg. If this is uncomfortable across the front of your hips, place a folded towel under your hip bones.

Exercises to be Done Supine

Pelvic Tilt

Lie with your knees and hips flexed and your feet flat on the floor. Tilt only your low back and pelvis, so your coccyx moves up to the ceiling and then down to the floor. This is a small movement that raises only the pelvis off the floor.

Pelvic Tilt Through the Back

Again, lie with your knees and hips flexed and your feet flat on the floor. Tilt your lower pelvis toward the ceiling, and then slowly flatten your low back on the floor as you did in the previous exercise. Gradually increase the tilt, allowing the hips, then the low back, then the mid-back to come off the floor. Pause, then slowly roll the spine back onto the floor. As you do this exercise, remember to keep your feet rooted into the floor, with the weight of your body on your feet, while you lift off the ground. Do the movements slowly. The abdominal muscles should remain lengthened as you roll up and down; they should not tighten up at any point.

Pelvic Clock

Don't add this exercise until you're able to do the previous two exercises with no discomfort. Begin in the same position, lying on the floor with your knees up. Slowly tilt your pelvis and lift it toward the ceiling. Focus your attention on the center of the sacrum, just above the coccyx. As you lower your pelvis, take it to the five o'clock position, rather than straight down to the six o'clock position. On the next tilt, bring your pelvis down to the four o'clock position. Now work your way back slowly toward six o'clock, and move toward the seven and eight o'clock positions.

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Depending on the client's needs, capabilities, and injuries, a person can typically do the Cat, the Dog, the Weight Shift, and the Pelvic Tilt in the first week. You can give the remaining exercises in the second or third week.

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Injection Therapy

The treatment includes six basic steps.

Step 1. Valium.

Step 2. Xylocaine.

Step 3. Manipulation.

Step 4. Proliferant.

Step 5. Exercises.

Step 6. Follow-up injections

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DVD #5 - Case Enactment

Post-Test

1. If resisted dorsiflexion of the ankle and resisted extension of the great toe is weak, what is the most likely injury?

Answer: _____

2. What are the most commonly injured structures in the low back?

Answer: _____

3. Pain down the back of the thigh and calf and into the heel is most commonly caused by injury to what structure?

Answer: _____

4. The most pressure is exerted on the low back discs during:
a. Sitting
b. Standing
c. Bending
d. Walking

Answer: _____

5. If there is low back pain associated with difficulty in excretory functions, this is a sign of:
a. A condition that should be referred to a urologist
b. an S4 nerve root compression
c. A pubic ligament sprain
d. an L5 central disc protrusion

Answer: _____

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6. Which spinal ligament connects consecutive spinous processes but is not continuous from one spinous process to another?
a. Supraspinous ligament
b. Interspinous ligament
c. Ligamentum flavum
d. Sacrotuberous ligament

Answer: _____

7. Pain that is referred from the low back region directly to the lateral calf is likely to be caused by an injury to what structure?

Answer: _____

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